corresponds to KR 1996-0038743

US005703997A

United States Patent [19]

Kitamura et al.

[11] Patent Number: 5,703,997

[45] Date of Patent: Dec. 30, 1997

[54] **DATA RECORDING MEDIUM HAVING REPRODUCTION TIMING INFORMATION, AND SYSTEM FOR REPRODUCING RECORD DATA BY USING THE REPRODUCTION TIMING INFORMATION**

[75] Inventors: **Tetsuya Kitamura**, Komae; **Hideki Mimura**, Yokohama, both of Japan

[73] Assignee: **Kabushiki Kaisha Toshiba**, Kawasaki, Japan

[21] Appl. No.: **630,763**

[22] Filed: **Apr. 11, 1996**

[30] **Foreign Application Priority Data**

Apr. 14, 1995 [JP] Japan 7-114007

[51] **Int. Cl.**^{6} **H04N 5/91**

[52] **U.S. Cl.** **386/97**; 386/96

[58] **Field of Search** 386/46, 54, 75, 386/97, 96, 104; 360/18; H04N 5/91, 5/928

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,614,982	9/1986	Ibaraki .	
4,680,647	7/1987	Moriyama .	
4,870,613	9/1989	Clinkenbeard .	
4,989,097	1/1991	Yoshio .	
4,992,886	2/1991	Klappert .	
5,010,417	4/1991	Yoshio .	
5,016,113	5/1991	Yamashita .	
5,043,826	8/1991	Yoshio .	
5,063,551	11/1991	Yoshio .	
5,065,252	11/1991	Yoshio .	
5,089,899	2/1992	Nomura et al.	386/46
5,097,349	3/1992	Nomura .	
5,107,343	4/1992	Kawai .	
5,138,925	8/1992	Koguchi .	
5,233,438	8/1993	Funahashi .	
5,237,426	8/1993	Daito .	
5,270,828	12/1993	Mogi .	
5,274,463	12/1993	Matsumoto .	
5,280,572	1/1994	Case .	
5,282,186	1/1994	Yoshio .	
5,315,400	5/1994	Kurata .	
5,336,844	8/1994	Yamauchi .	
5,359,582	10/1994	Kim .	
5,400,077	3/1995	Cookson .	
5,442,456	8/1995	Hansen .	
5,513,010	4/1996	Kori .	

FOREIGN PATENT DOCUMENTS

0 546 189 A1	6/1993	European Pat. Off. .
0 663 560 A1	1/1995	European Pat. Off. .
0 661 888 A2	7/1995	European Pat. Off. .
0 661 888 A3	7/1995	European Pat. Off. .
4-28056	1/1992	Japan .
4-57275	2/1992	Japan .
4-67470	3/1992	Japan .
4-212768	8/1992	Japan .
4-245090	9/1992	Japan .
4-245091	9/1992	Japan .
5-159468	6/1993	Japan .
6-28780	2/1994	Japan .
8-149407	11/1994	Japan .
WO 94/30014	12/1994	WIPO .

OTHER PUBLICATIONS

Digital Audio and Ancillary Data Services for an Advanced Television Service, Advanced Television Systems Committee, Technology Group on Distribution, Doc. T3/186, Feb. 3, 1992.

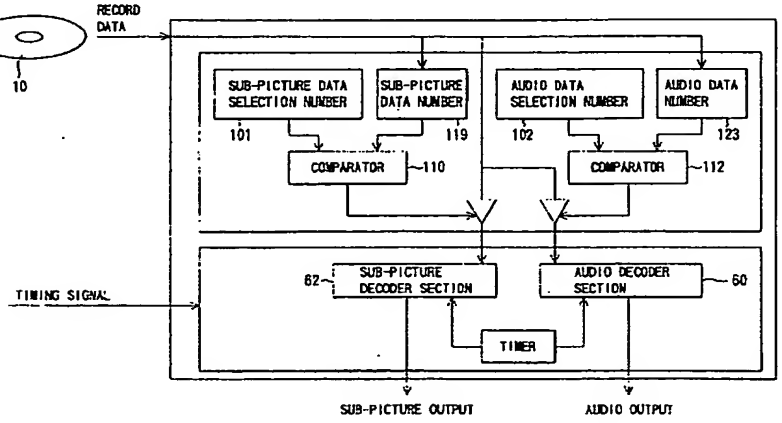
Primary Examiner—Robert Chevalier

Attorney, Agent, or Firm—Cushman Darby & Cushman IP Group of Pillsbury Madison & Sutro LLP

[57] **ABSTRACT**

In a system wherein video data and audio data are reproduced in a non-presentation mode of sub-picture data, control information having an effect process command is transferred to a system CPU before the video data is transferred to a decoder section. After the reproduction of the video data and the audio data selected in association with the video data, e.g. English audio data, is started, sub-picture data, e.g. an English caption, is forcibly presented at a predetermined timing under the effect process command. After a predetermined time period, the presentation of the sub-picture data is disabled by the effect process command.

23 Claims, 17 Drawing Sheets



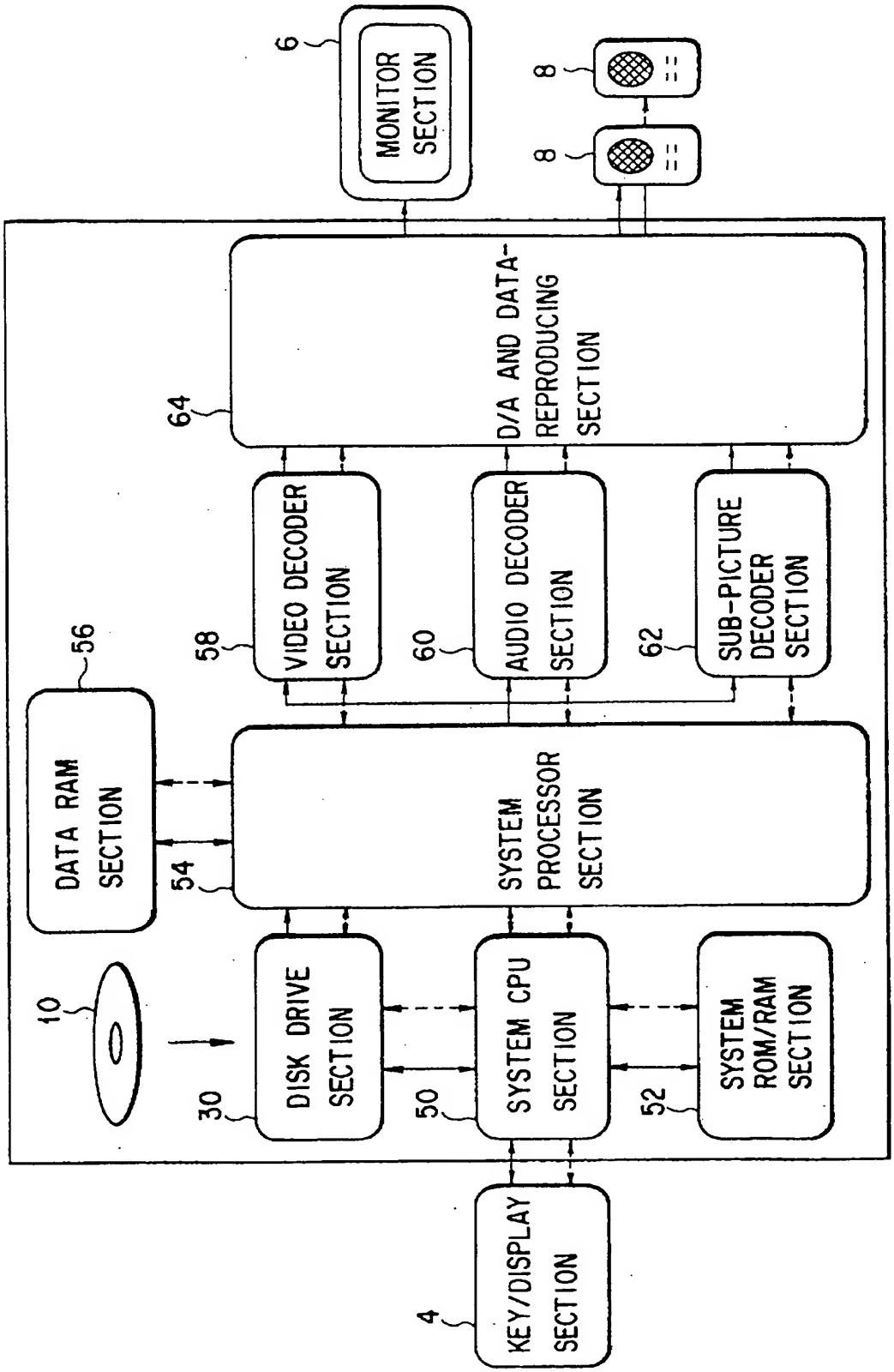

6
MONITOR SECTION
8
8
64
D/A AND DATA-REPRODUCING SECTION
58
VIDEO DECODER SECTION
60
AUDIO DECODER SECTION
62
SUB-PICTURE DECODER SECTION
56
DATA RAM SECTION
54
SYSTEM PROCESSOR SECTION
10
30
DISK DRIVE SECTION
50
SYSTEM CPU SECTION
52
SYSTEM ROM/RAM SECTION
4
KEY/DISPLAY SECTION

FIG. 1

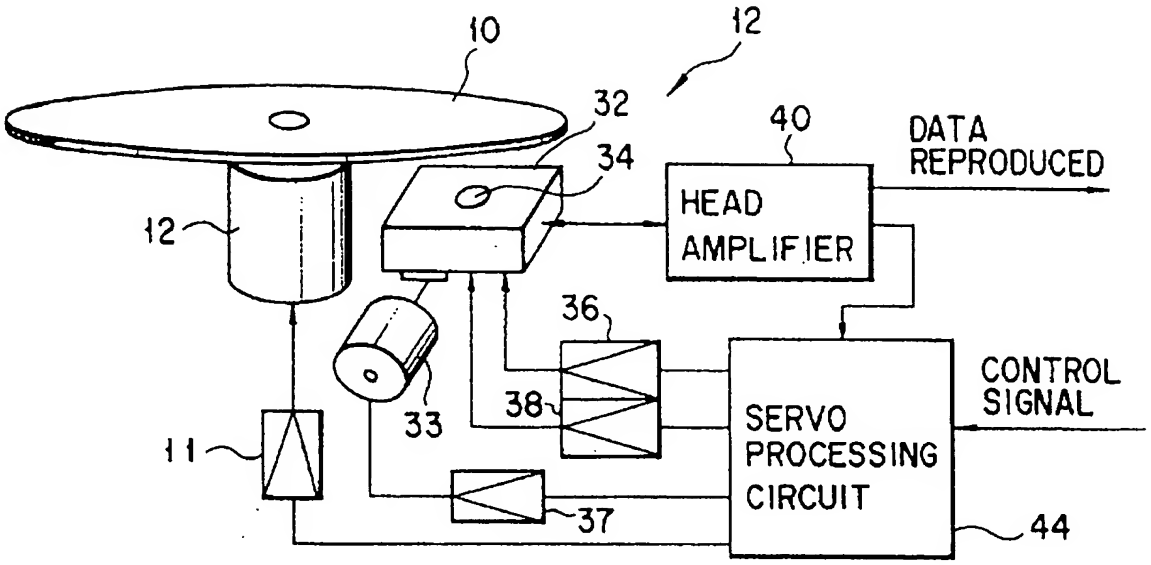

10
12
32
34
40
DATA REPRODUCED
HEAD AMPLIFIER
12
36
33
38
CONTROL SIGNAL
SERVO PROCESSING CIRCUIT
11
37
44

FIG. 2

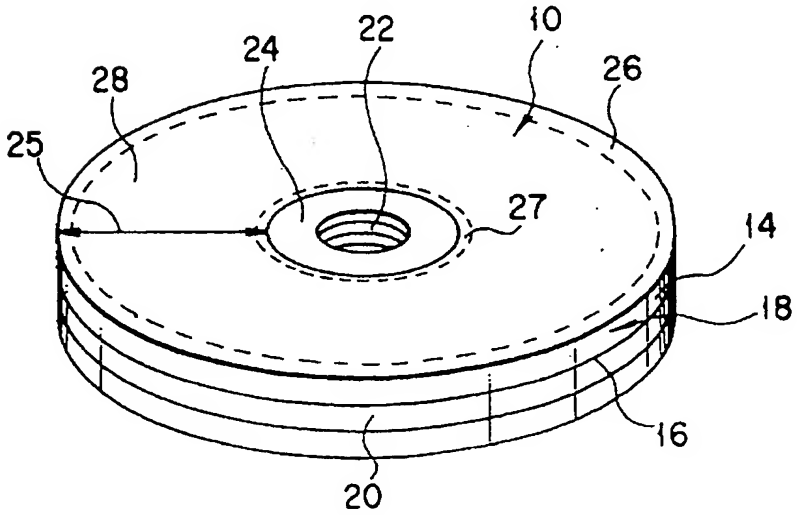

10
22
24
28
26
25
27
14
18
16
20

FIG. 3

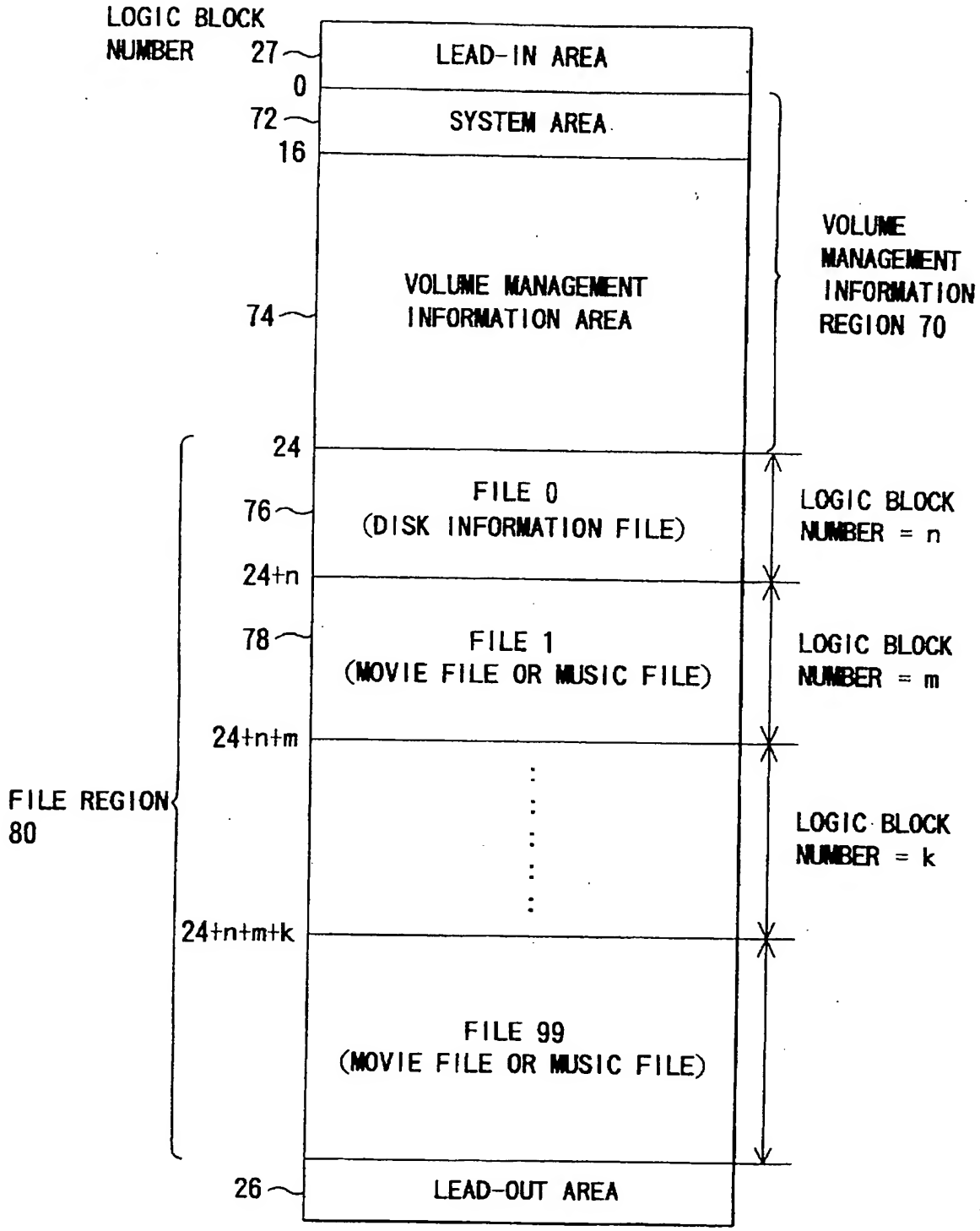

LOGIC BLOCK NUMBER
27
LEAD-IN AREA
0
72
SYSTEM AREA
16
VOLUME MANAGEMENT INFORMATION AREA
74
VOLUME MANAGEMENT INFORMATION REGION 70
24
FILE 0 (DISK INFORMATION FILE)
76
LOGIC BLOCK NUMBER = n
24+n
FILE 1 (MOVIE FILE OR MUSIC FILE)
78
LOGIC BLOCK NUMBER = m
24+n+m
LOGIC BLOCK NUMBER = k
FILE REGION 80
24+n+m+k
FILE 99 (MOVIE FILE OR MUSIC FILE)
26
LEAD-OUT AREA

FIG. 4

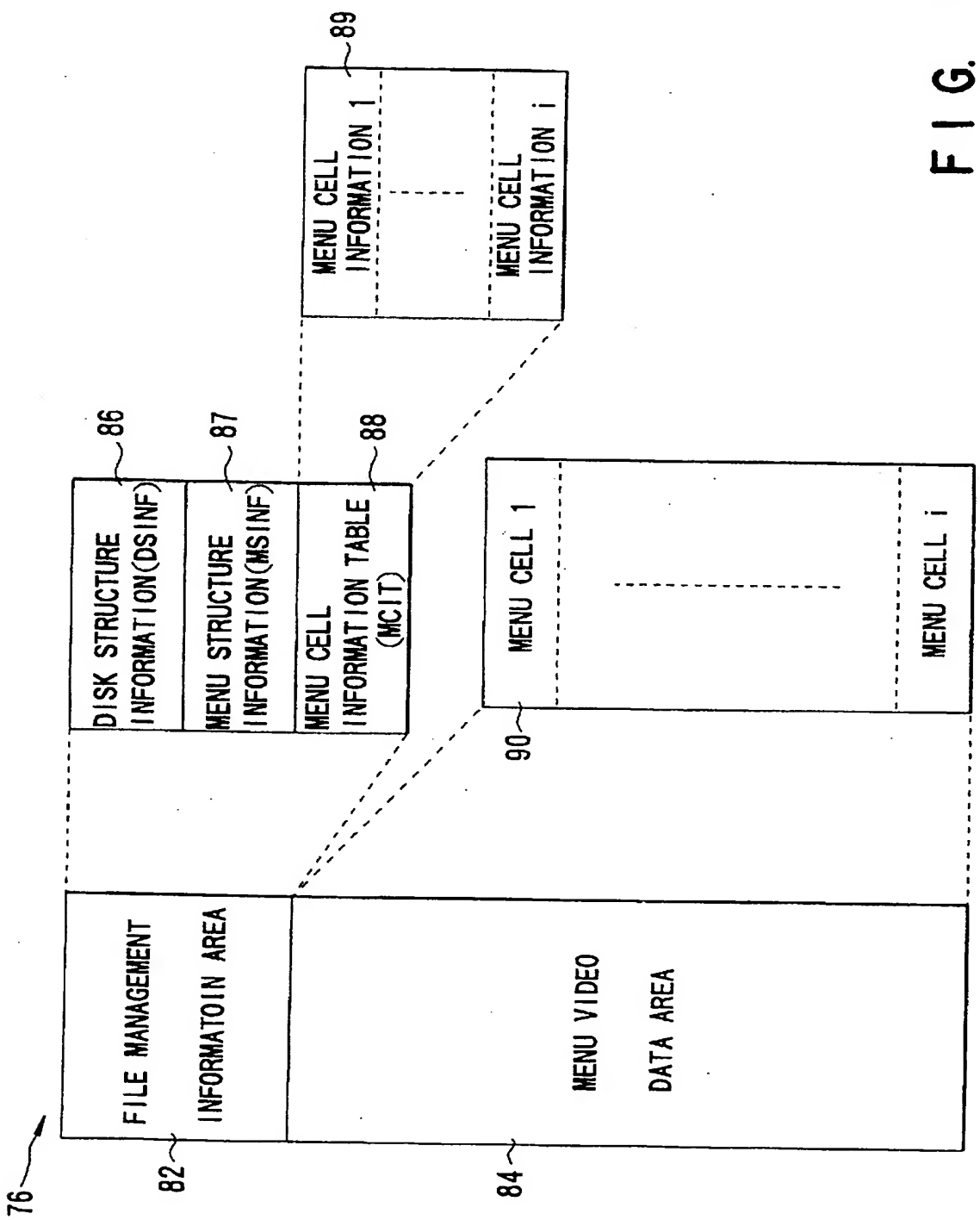

76
82
FILE MANAGEMENT INFORMATOIN AREA
84
MENU VIDEO DATA AREA
86
DISK STRUCTURE INFORMATION(DSINF)
87
MENU STRUCTURE INFORMATION(MSINF)
88
MENU CELL INFORMATION TABLE (MCIT)
89
MENU CELL INFORMATION 1
MENU CELL INFORMATION i
90
MENU CELL 1
MENU CELL i

FIG. 5

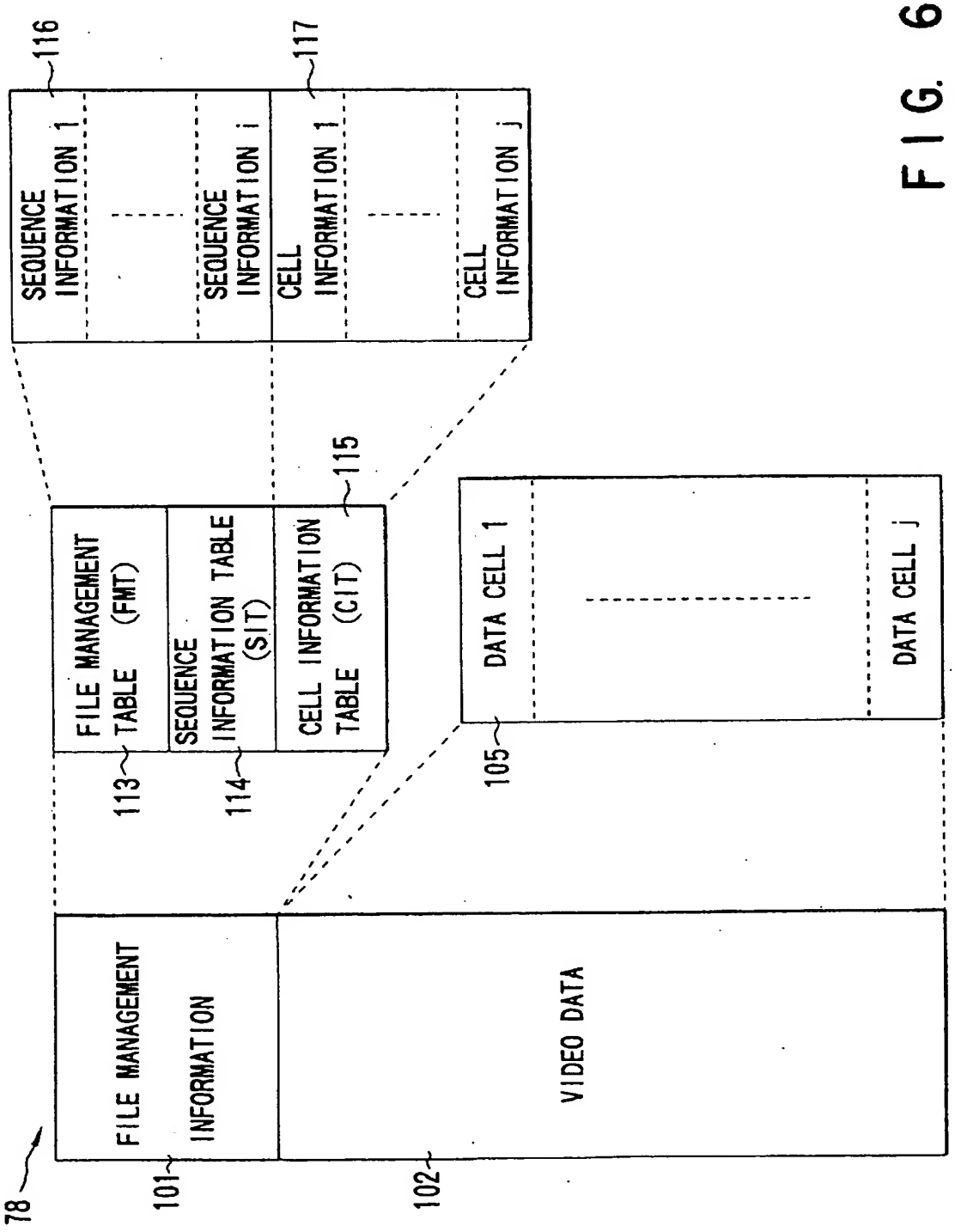

78
101
FILE MANAGEMENT INFORMATION
102
VIDEO DATA
113
FILE MANAGEMENT TABLE (FMT)
114
SEQUENCE INFORMATION TABLE (SIT)
115
CELL INFORMATION TABLE (CIT)
105
DATA CELL 1
DATA CELL j
116
SEQUENCE INFORMATION 1
SEQUENCE INFORMATION i
117
CELL INFORMATION 1
CELL INFORMATION j

FIG. 6

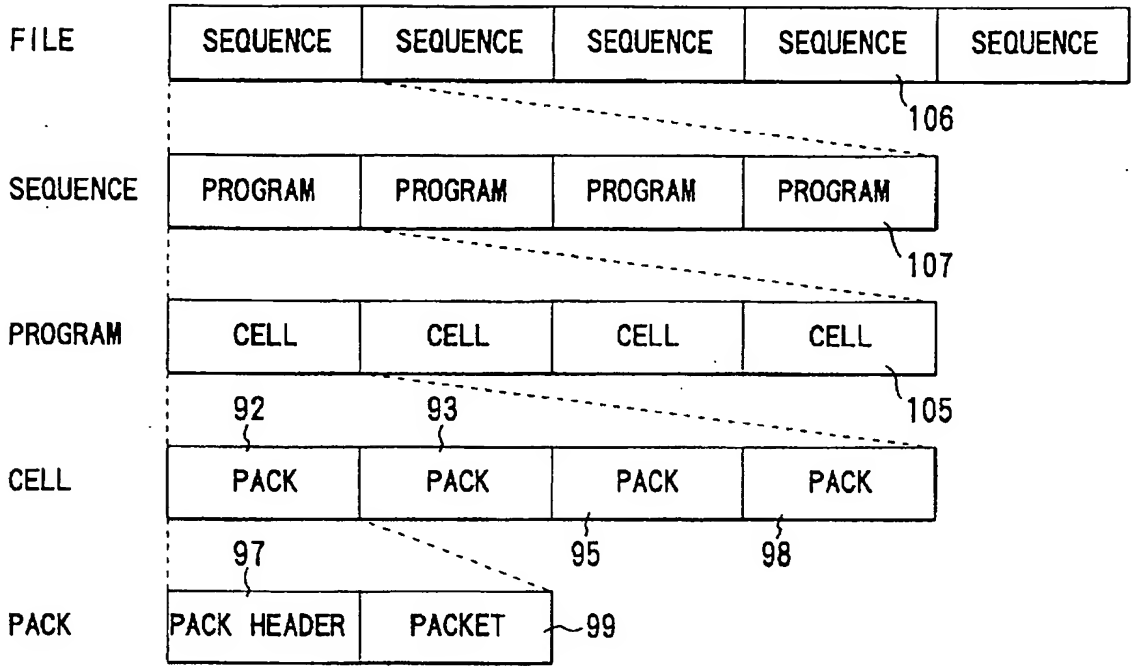

FILE
SEQUENCE
SEQUENCE
SEQUENCE
SEQUENCE
SEQUENCE
106
SEQUENCE
PROGRAM
PROGRAM
PROGRAM
PROGRAM
107
PROGRAM
CELL
CELL
CELL
CELL
105
92
93
CELL
PACK
PACK
PACK
PACK
97
95
98
PACK
PACK HEADER
PACKET
99

FIG. 7

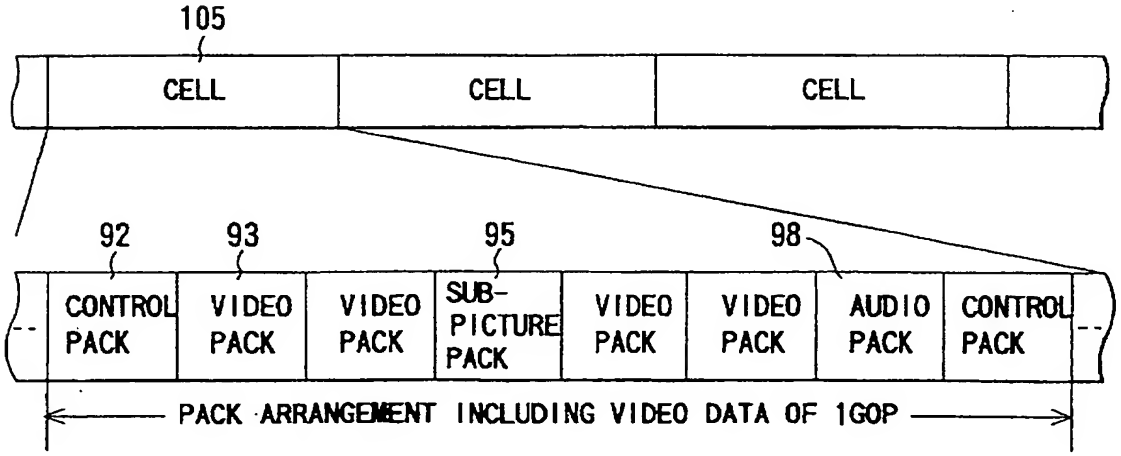

105
CELL
CELL
CELL
92
93
95
98
CONTROL PACK
VIDEO PACK
VIDEO PACK
SUB-PICTURE PACK
VIDEO PACK
VIDEO PACK
AUDIO PACK
CONTROL PACK
PACK ARRANGEMENT INCLUDING VIDEO DATA OF 1GOP

FIG. 8

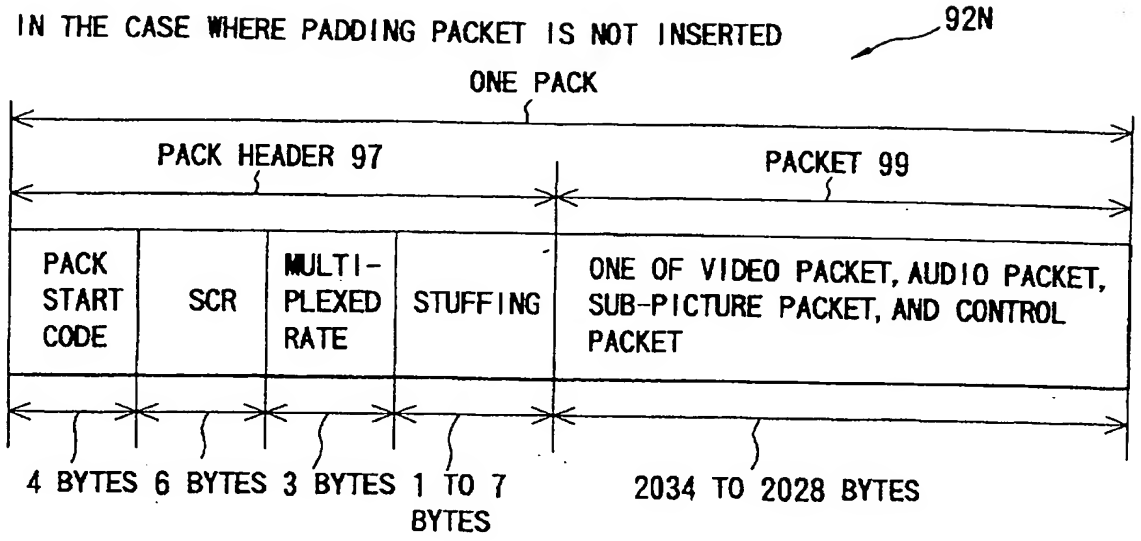

IN THE CASE WHERE PADDING PACKET IS NOT INSERTED
92N
ONE PACK
PACK HEADER 97
PACKET 99
PACK START CODE
SCR
MULTI-PLEXED RATE
STUFFING
ONE OF VIDEO PACKET, AUDIO PACKET, SUB-PICTURE PACKET, AND CONTROL PACKET
4 BYTES
6 BYTES
3 BYTES
1 TO 7 BYTES
2034 TO 2028 BYTES

FIG. 9A

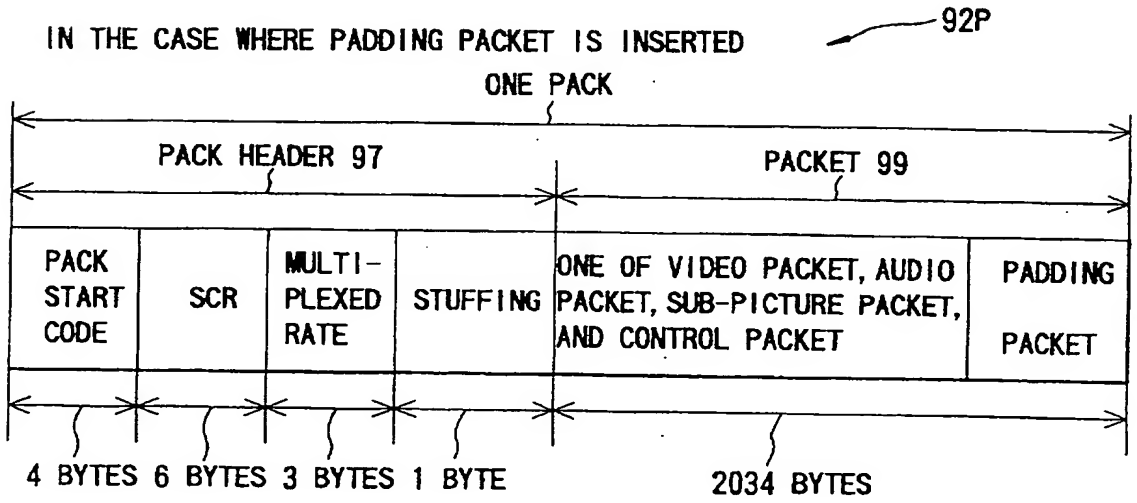

IN THE CASE WHERE PADDING PACKET IS INSERTED
92P
ONE PACK
PACK HEADER 97
PACKET 99
PACK START CODE
SCR
MULTI-PLEXED RATE
STUFFING
ONE OF VIDEO PACKET, AUDIO PACKET, SUB-PICTURE PACKET, AND CONTROL PACKET
PADDING PACKET
4 BYTES
6 BYTES
3 BYTES
1 BYTE
2034 BYTES

FIG. 9B

DSI (DESCRIPTION ORDER)

CONTENTS	NUMBER OF STRUCTURE BYTES
GENERAL INFORMATION	32 BYTES
REPRODUCTION SYNC INFORMATION	544 BYTES
DSI PACK ADDRESS INFORMATION	128 BYTES
EFFECT INFORMATION	128 BYTES

FIG. 10

GENERAL INFORMATION (DESCRIPTION ORDER)

PARAMETER	CONTENTS	NUMBER OF STRUCTURE BYTES
DSCR	SCR OF DSI	5 BYTES
VSPTS	PRESENTATION TIME STAMP OF GOP	5 BYTES
DLBN	LOGIC BLOCK NUMBER OF DSI	4 BYTES
CELN	CELL NUMBER	2 BYTES

FIG. 11

REPRODUCTION SYNC INFORMATION (DESCRIPTION ORDER)

PARAMETER	CONTENTS	NUMBER OF STRUCTURE BYTES
VPTS	PTS OF INTRA-PICTURE	5 BYTES
VPSA	PACK ADDRESS INCLUDING INTRA-PICTURE	4 BYTES
APTS 0-7	PTS OF AUDIO DATA	5 BYTES x 8
APSA 0-7	ADDRESS OF AUDIO PACK	4 BYTES x 8
SPPTS 0-31	PTS OF SUB-PICTURE	10 BYTES x 32
SPPSA 0-31	ADDRESS OF SUB-PICTURE AUDIO PACK	4 BYTES x 32

FIG. 12

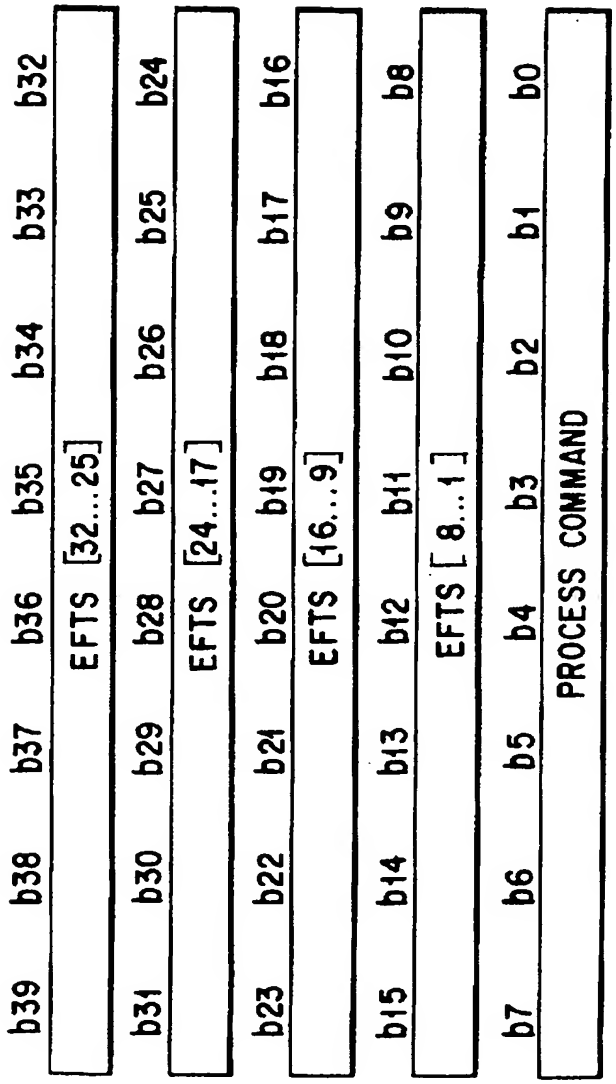


FIG. 13

EFFECT PROCESS COMMAND

CODE	CONTENT OF PROCESS
0000 0000	NO PROCESS
0100 XXXX	START FORCIBLE PRESENTATION OF SUB-PICTURE FROM FIRST FRAME AFTER EFTS (XXXX: AUDIO STREAM NUMBER ★)
0101 XXXX	STOP FORCIBLE PRESENTATION OF SUB-PICTURE FROM FIRST FRAME AFTER EFTS (XXXX: AUDIO STREAM NUMBER ★)

FIG. 14

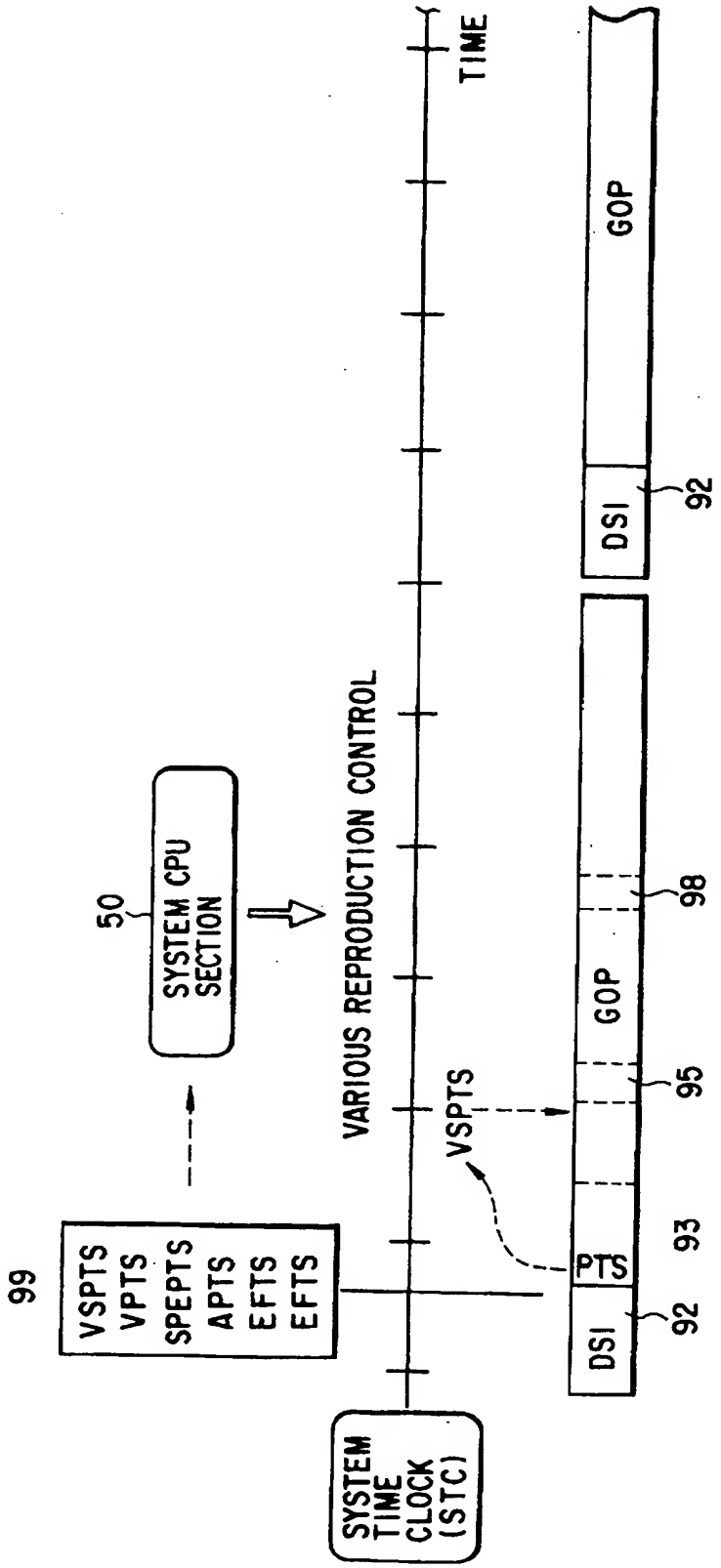

TIME
GOP
DSI
92
98
GOP
95
VSPTS
93
PTS
DSI
92
VARIOUS REPRODUCTION CONTROL
50
SYSTEM CPU SECTION
99
VSPTS
VPTS
SPEPTS
APTS
EFTS
EFTS
SYSTEM TIME CLOCK (STC)

FIG. 15

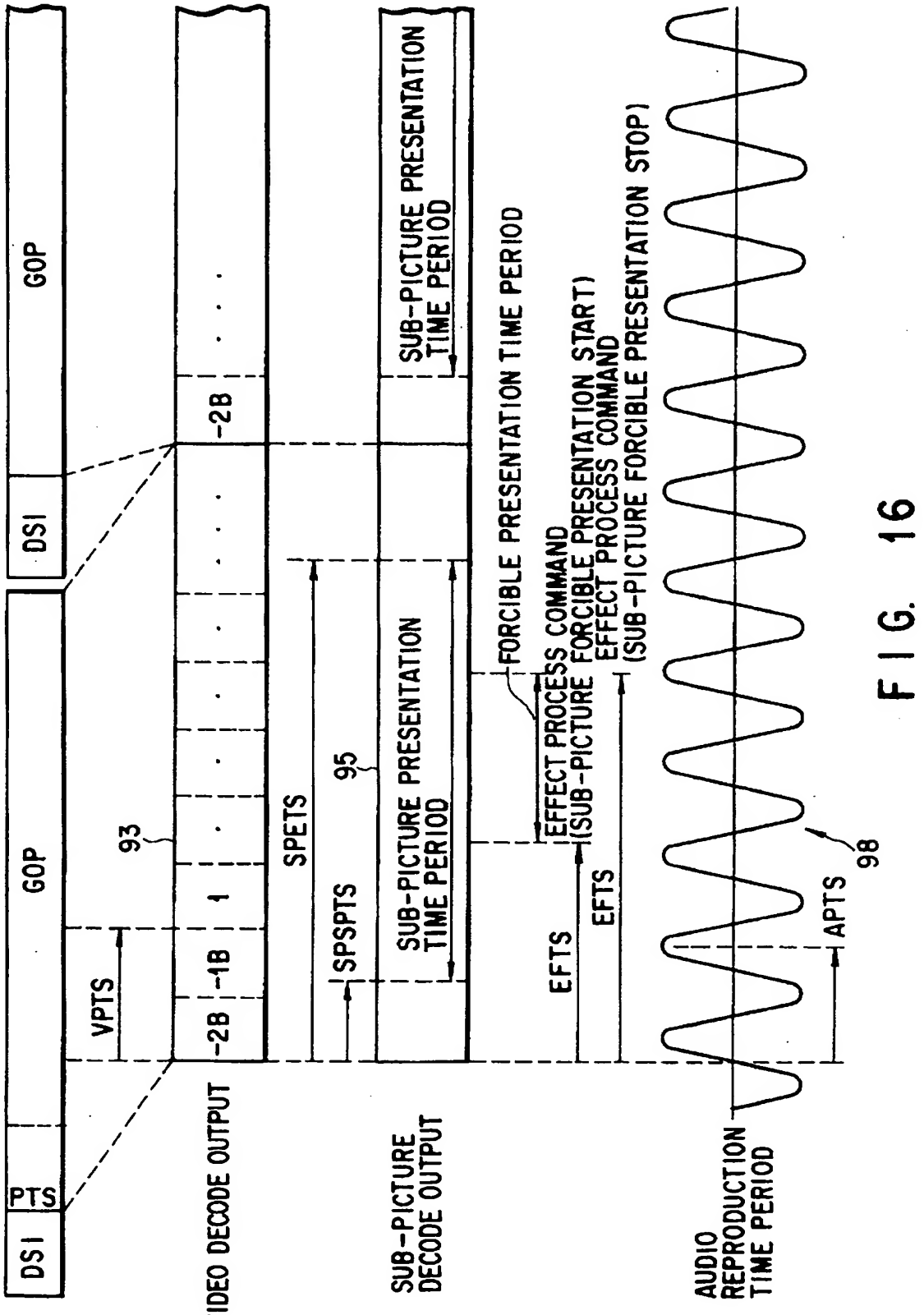

DSI
PTS
GOP
DSI
GOP
VPTS
93
VIDEO DECODE OUTPUT
-2B
-1B
1
SPETS
SPSPTS
95
SUB-PICTURE PRESENTATION TIME PERIOD
SUB-PICTURE DECODE OUTPUT
SUB-PICTURE PRESENTATION TIME PERIOD
FORCIBLE PRESENTATION TIME PERIOD
EFFECT PROCESS COMMAND (SUB-PICTURE FORCIBLE PRESENTATION START)
EFTS
EFFECT PROCESS COMMAND (SUB-PICTURE FORCIBLE PRESENTATION STOP)
EFTS
APTS
98
AUDIO REPRODUCTION TIME PERIOD

FIG. 16

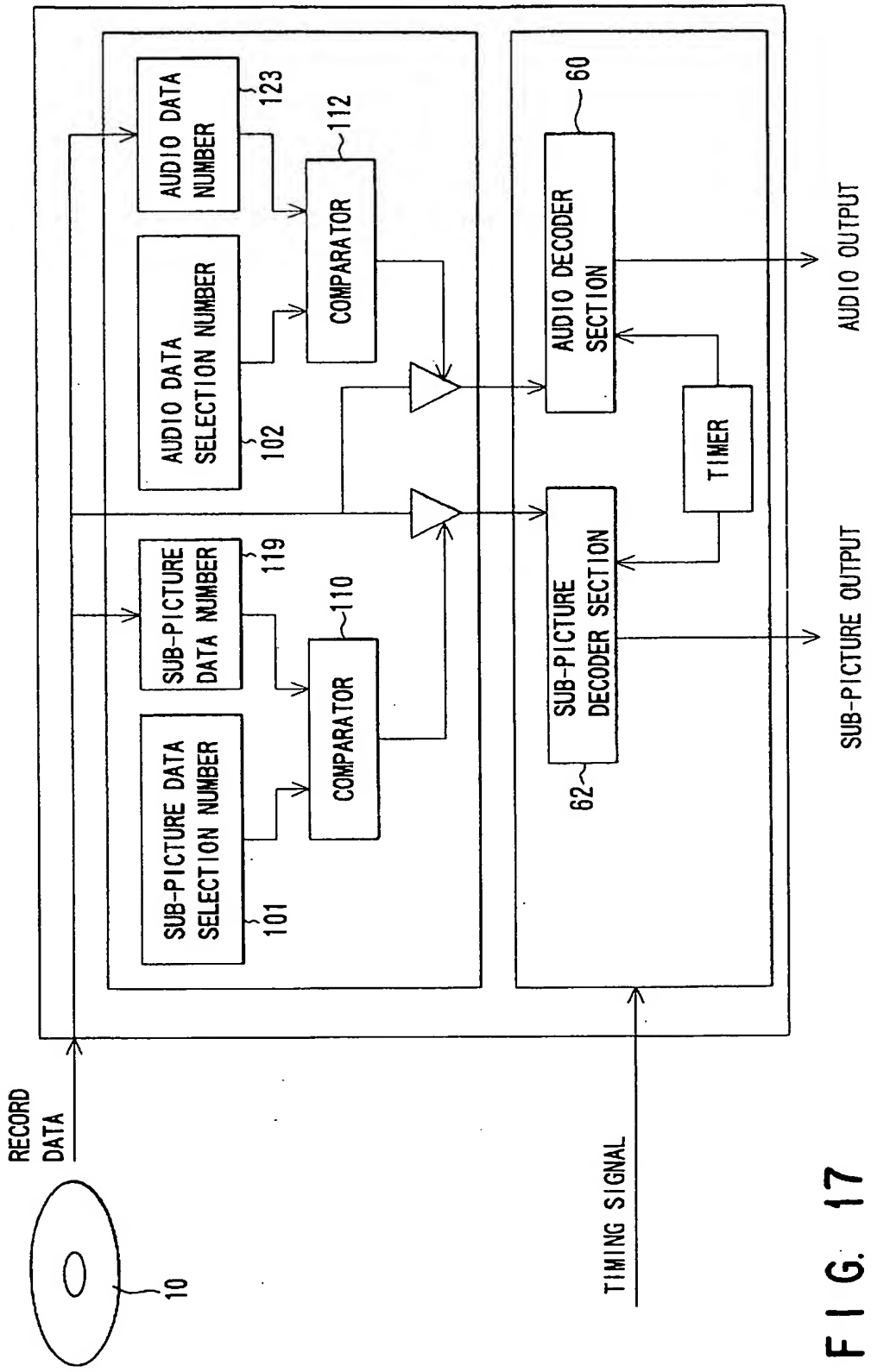

AUDIO DATA NUMBER
123
112
COMPARATOR
AUDIO DATA SELECTION NUMBER
102
SUB-PICTURE DATA NUMBER
119
110
COMPARATOR
SUB-PICTURE DATA SELECTION NUMBER
101
60
AUDIO DECODER SECTION
TIMER
SUB-PICTURE DECODER SECTION
62
AUDIO OUTPUT
SUB-PICTURE OUTPUT
RECORD DATA
TIMING SIGNAL
10

FIG. 17

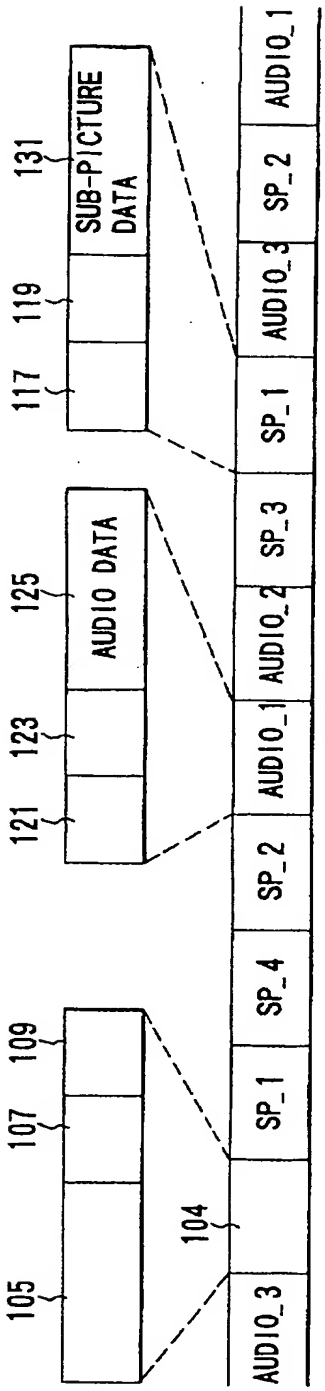

105
107
109
104
AUDIO_3
SP_1
SP_4
SP_2
AUDIO_1
AUDIO_2
SP_3
AUDIO_3
SP_1
SP_2
AUDIO_1
121
123
125
AUDIO DATA
117
119
131
SUB-PICTURE DATA
RECORD DATA

FIG. 18

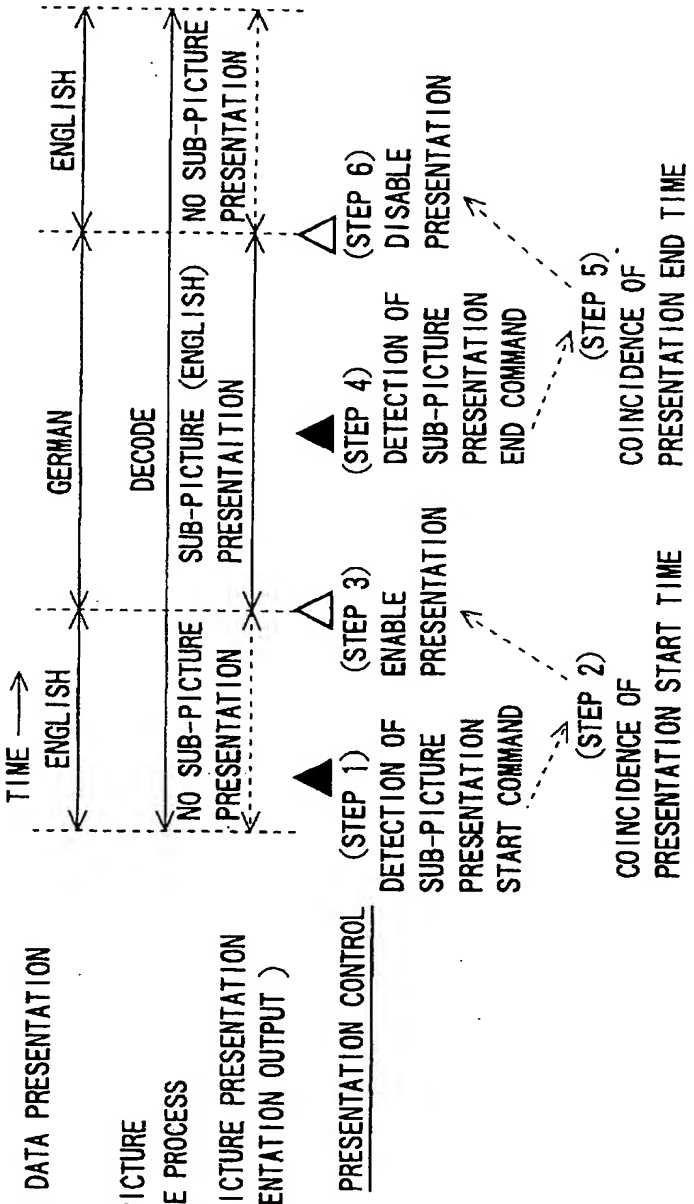

TIME
AUDIO DATA PRESENTATION STATE
ENGLISH
GERMAN
ENGLISH
SUB-PICTURE DECODE PROCESS
DECODE
NO SUB-PICTURE
SUB-PICTURE (ENGLISH)
NO SUB-PICTURE
SUB-PICTURE PRESENTATION (PRESENTATION OUTPUT)
PRESENTATION
PRESENTAITION
PRESENTATION
PRESENTATION CONTROL
(STEP 1) DETECTION OF SUB-PICTURE PRESENTATION START COMMAND
(STEP 2) COINCIDENCE OF PRESENTATION START TIME
(STEP 3) ENABLE PRESENTATION
(STEP 4) DETECTION OF SUB-PICTURE PRESENTATION END COMMAND
(STEP 5) COINCIDENCE OF PRESENTATION END TIME
(STEP 6) DISABLE PRESENTATION

FIG. 19

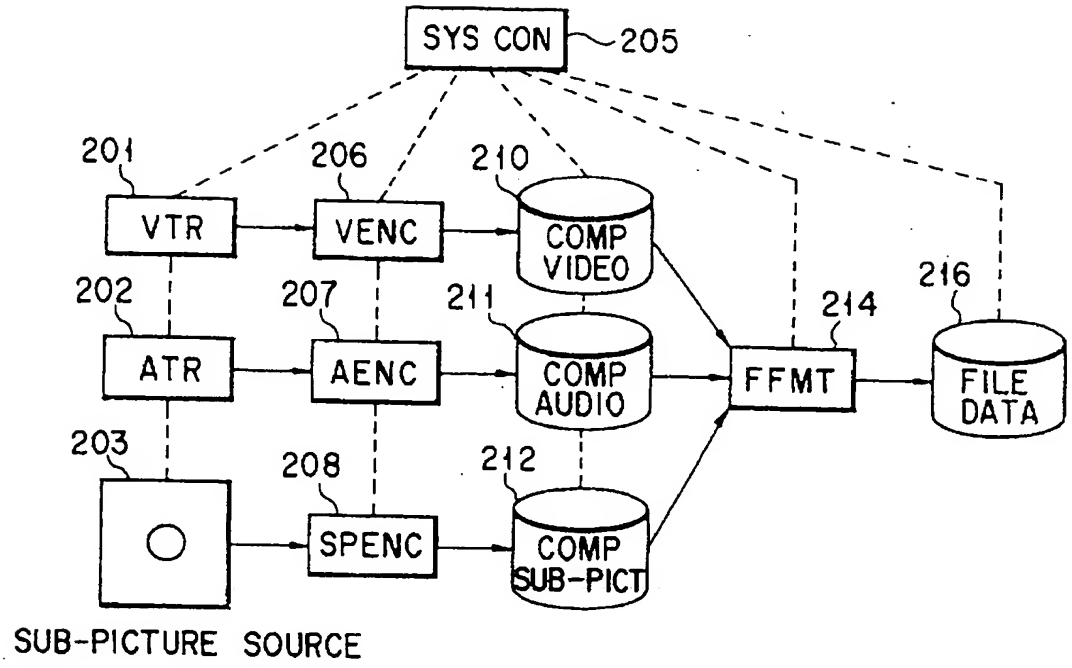

SYS CON
205
201
206
210
VTR
VENC
COMP VIDEO
202
207
211
214
216
ATR
AENC
COMP AUDIO
FFMT
FILE DATA
203
208
212
SPENC
COMP SUB-PICT
SUB-PICTURE SOURCE

FIG. 20

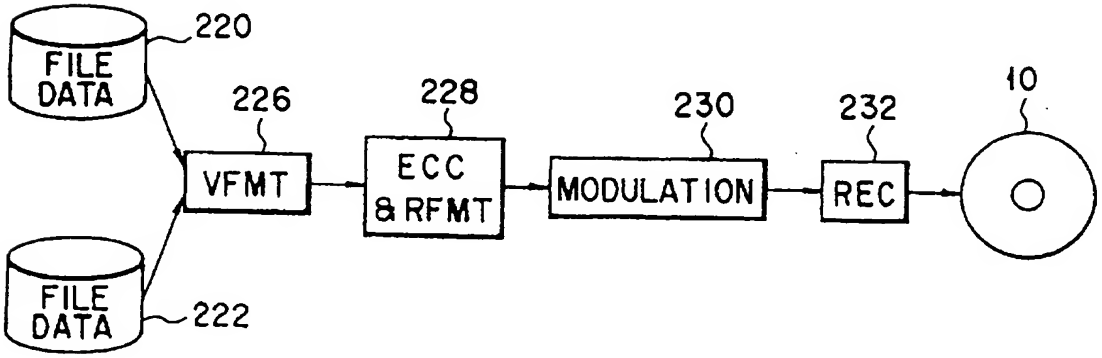

220
FILE DATA
226
228
230
232
10
VFMT
ECC & RFMT
MODULATION
REC
FILE DATA
222

FIG. 23

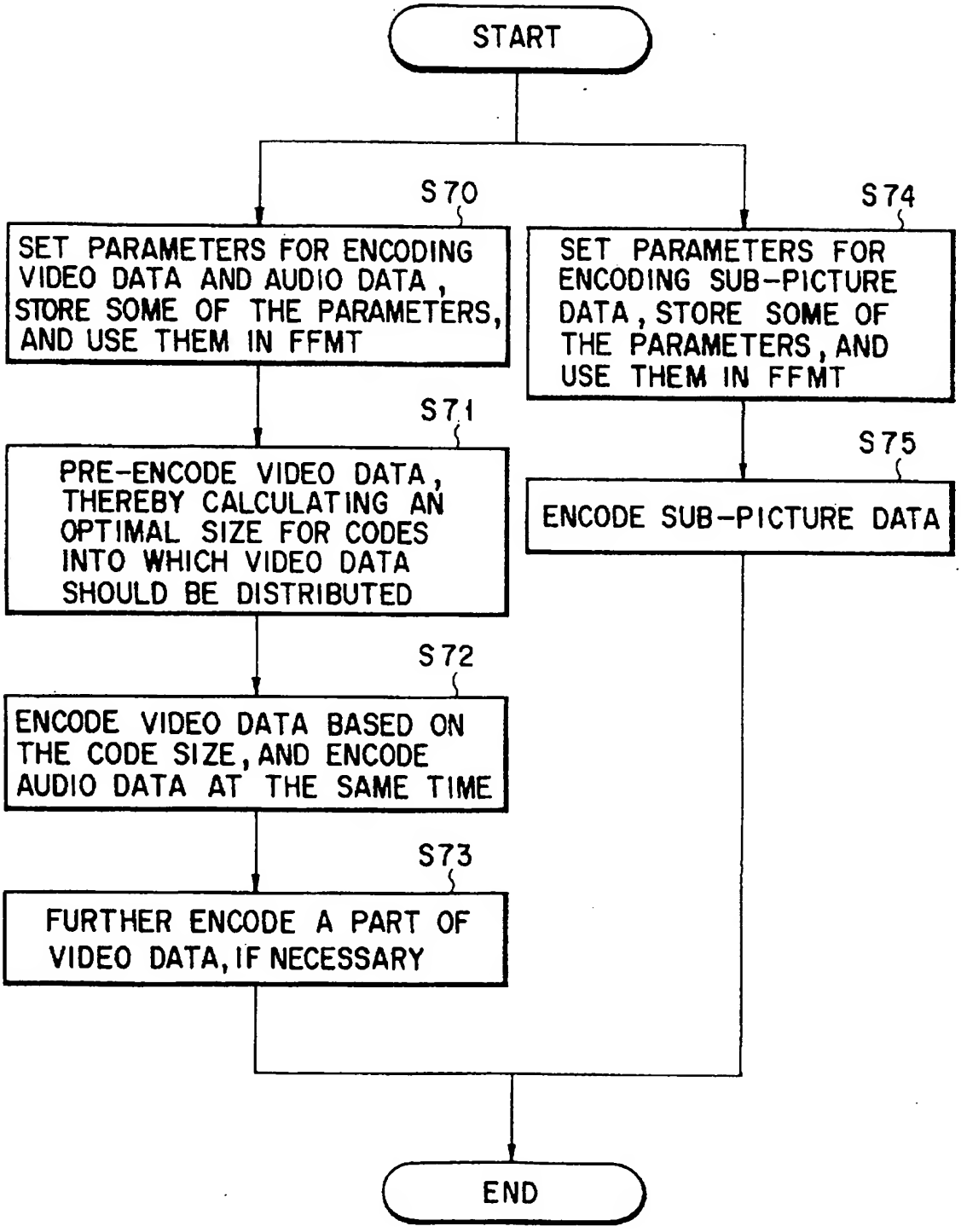

START
S70
SET PARAMETERS FOR ENCODING VIDEO DATA AND AUDIO DATA, STORE SOME OF THE PARAMETERS, AND USE THEM IN FFMT
S71
PRE-ENCODE VIDEO DATA, THEREBY CALCULATING AN OPTIMAL SIZE FOR CODES INTO WHICH VIDEO DATA SHOULD BE DISTRIBUTED
S72
ENCODE VIDEO DATA BASED ON THE CODE SIZE, AND ENCODE AUDIO DATA AT THE SAME TIME
S73
FURTHER ENCODE A PART OF VIDEO DATA, IF NECESSARY
S74
SET PARAMETERS FOR ENCODING SUB-PICTURE DATA, STORE SOME OF THE PARAMETERS, AND USE THEM IN FFMT
S75
ENCODE SUB-PICTURE DATA
END

FIG. 21

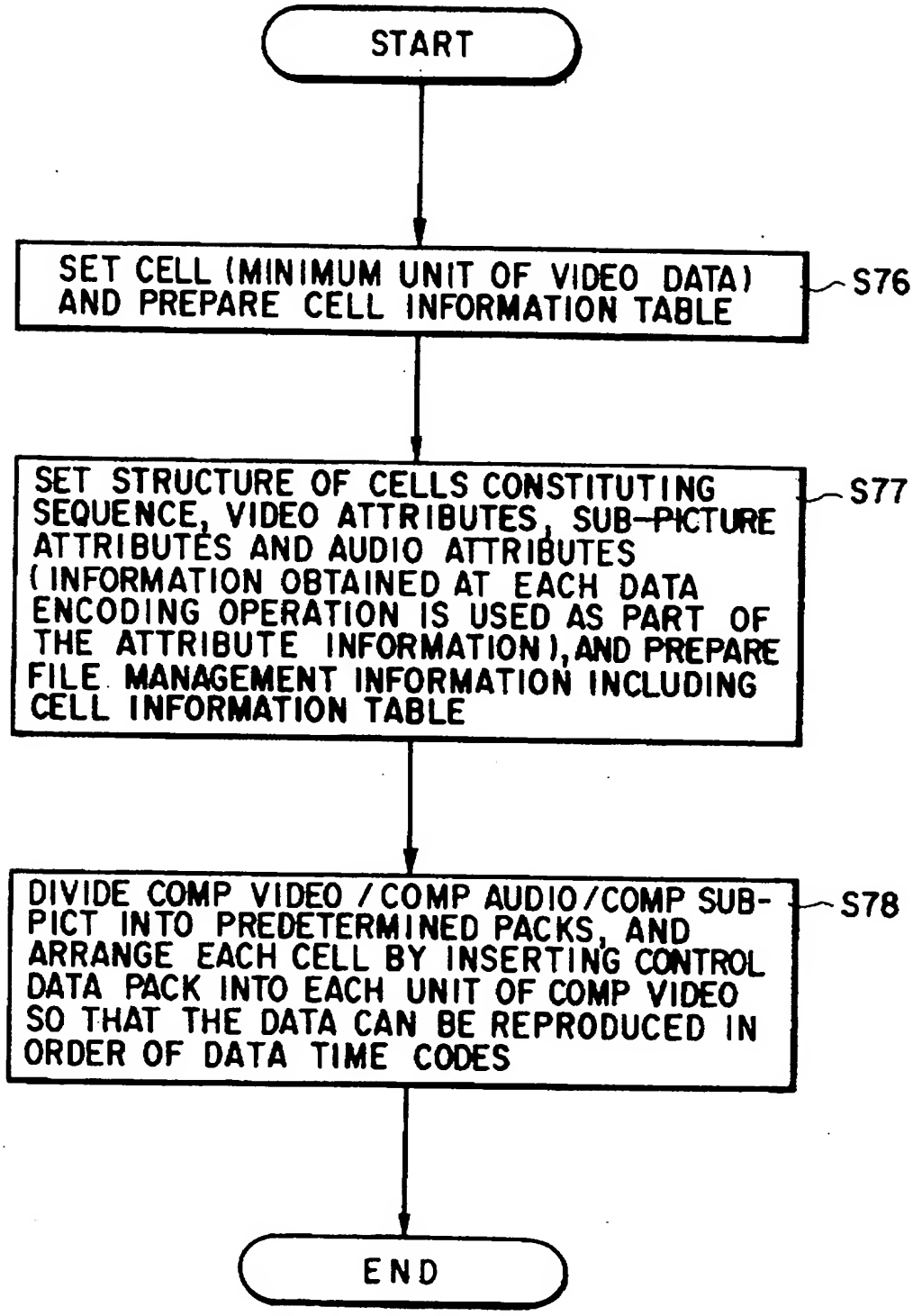

START
SET CELL (MINIMUM UNIT OF VIDEO DATA) AND PREPARE CELL INFORMATION TABLE
S76
SET STRUCTURE OF CELLS CONSTITUTING SEQUENCE, VIDEO ATTRIBUTES, SUB-PICTURE ATTRIBUTES AND AUDIO ATTRIBUTES (INFORMATION OBTAINED AT EACH DATA ENCODING OPERATION IS USED AS PART OF THE ATTRIBUTE INFORMATION), AND PREPARE FILE MANAGEMENT INFORMATION INCLUDING CELL INFORMATION TABLE
S77
DIVIDE COMP VIDEO / COMP AUDIO / COMP SUB-PICT INTO PREDETERMINED PACKS, AND ARRANGE EACH CELL BY INSERTING CONTROL DATA PACK INTO EACH UNIT OF COMP VIDEO SO THAT THE DATA CAN BE REPRODUCED IN ORDER OF DATA TIME CODES
S78
END

FIG. 22

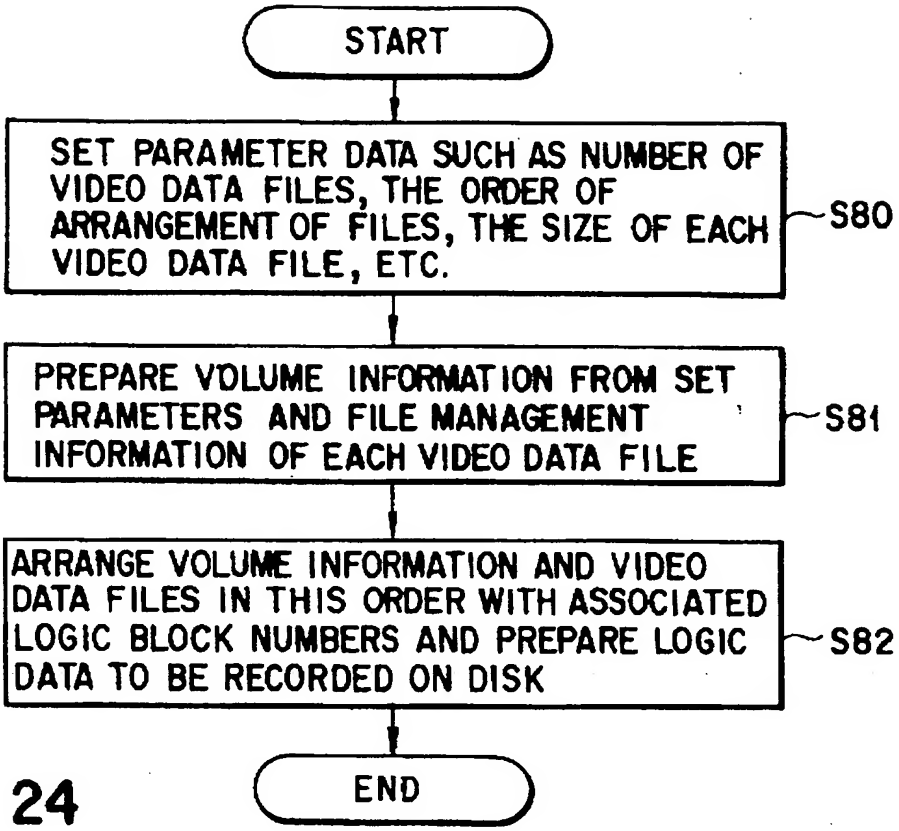

START
SET PARAMETER DATA SUCH AS NUMBER OF VIDEO DATA FILES, THE ORDER OF ARRANGEMENT OF FILES, THE SIZE OF EACH VIDEO DATA FILE, ETC.
S80
PREPARE VOLUME INFORMATION FROM SET PARAMETERS AND FILE MANAGEMENT INFORMATION OF EACH VIDEO DATA FILE
S81
ARRANGE VOLUME INFORMATION AND VIDEO DATA FILES IN THIS ORDER WITH ASSOCIATED LOGIC BLOCK NUMBERS AND PREPARE LOGIC DATA TO BE RECORDED ON DISK
S82
END

FIG. 24

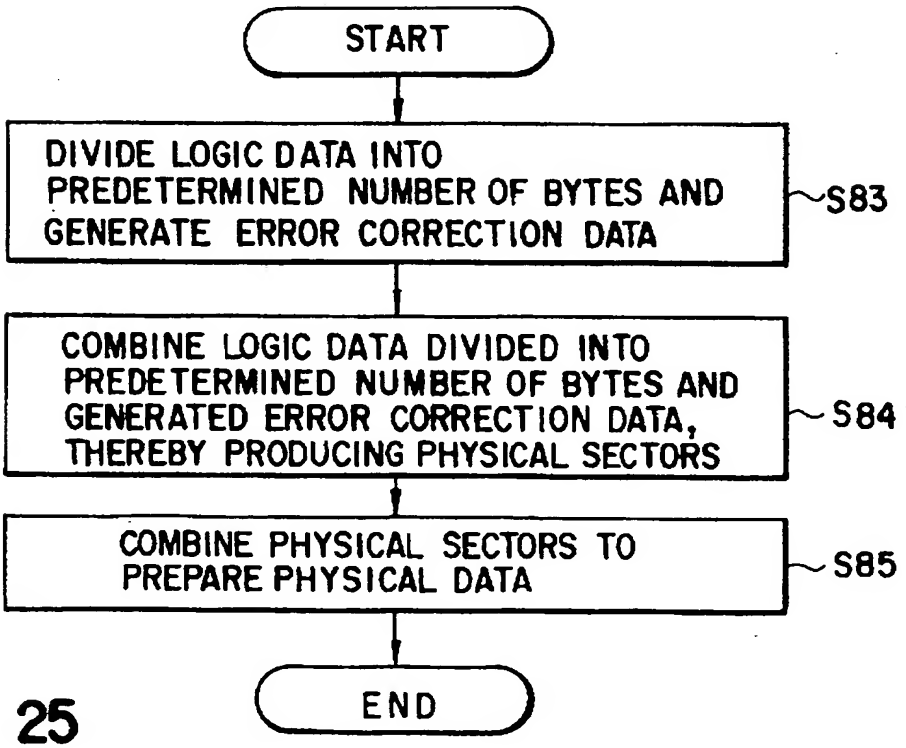

START
DIVIDE LOGIC DATA INTO PREDETERMINED NUMBER OF BYTES AND GENERATE ERROR CORRECTION DATA
S83
COMBINE LOGIC DATA DIVIDED INTO PREDETERMINED NUMBER OF BYTES AND GENERATED ERROR CORRECTION DATA, THEREBY PRODUCING PHYSICAL SECTORS
S84
COMBINE PHYSICAL SECTORS TO PREPARE PHYSICAL DATA
S85
END

FIG. 25

DATA RECORDING MEDIUM HAVING REPRODUCTION TIMING INFORMATION, AND SYSTEM FOR REPRODUCING RECORD DATA BY USING THE REPRODUCTION TIMING INFORMATION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a data recording medium having reproduction timing information, a method of recording data along with reproduction timing information, an apparatus for recording data along with reproduction timing information, a method of reproducing data along with reproduction timing information, and an apparatus for reproducing data along with reproduction timing information, and more particularly, to a data recording method of recording various data, such as digital audio data, and sub-picture data on a recording medium, such as an optical disk, a data recording apparatus for recording the data on the recording medium, a recording medium used in these method and apparatus, a data reproducing method of reproducing the data on the recording medium, and a data reproducing apparatus for reproducing the data on the recording medium.

2. Description of the Related Art

Recently, remarkable progress is observed in the development of an optical disk reproducing apparatus adaptable to playback a moving picture. This apparatus performs data reproduction from an optical disk serving as a recording medium on which digital data of pictures, sounds, etc. are recorded at high density by compression, in order to drive a monitor display or a speaker according to the reproduced digital data. It is expected that many software suppliers will release a variety of software represented by movie programs or "karaoke" sing-along programs for use in the above-mentioned apparatus after mass production thereof comes into practice.

Conventionally, video tapes are used as a video recording medium. The video tape does not have a large amount of record capacity per unit area as compared to the optical disk, and do not provide a complicated random access to the recorded data. Therefore, video data is normally recorded along with audio data, and optionally along with a single item of sub-picture data. The audio data and the sub-picture data are selectively reproduced in a conventional reproducing system. When the sub-picture data is selected, the conventional reproducing system simply reproduces the sub-picture data recorded on the video tape. Because the reproduction state and reproduction time of the sub-picture data are not controlled, the sub-picture presented for each scene cannot be changed, for example.

A video recording medium with an English caption is now prevailing in the U.S. The English caption is recorded on the recording medium in the form of sub-picture data, and selectively turned on and off in a reproducing system of the recording medium. If the English caption is turned off, the reproducing system continuously disables presentation of the English caption, irrespective of conversations represented by audio data otherwise reproduced together with the sub-picture data.

A problem arises in a case where the recording medium has audio data representing not only audio data of English conversations, but also other language conversations. If the English caption is turned off in the reproducing system, no English caption will be presented even when the other language conversations is presented. Specifically, suppose a scene in which the protagonist speaks French on a journey from an English-speaking country to a French-speaking country. Unless an English caption associated with the French conversation is presented, the English-speaking viewers may not understand the French conversation. Similarly, suppose a scene in which the protagonist is viewing the German-language label of a medicine. Unless an English caption associated with the German-language label is presented, the English-speaking viewers may not understand the medicine label.

The aforementioned problem may be solved by preparing an additional English caption associated with the conversations of languages other than English and used when the primary or main English caption is turned off. In this case, however, double recording spaces are required to record sub-picture data of the primary English caption and sub-picture data of the additional English caption, respectively.

SUMMARY OF THE INVENTION

An object of the invention is to provide a data recording medium with which a sub-picture can be presented at a proper timing in accordance with the kind of audio data to be reproduced.

Another object of the invention is to provide a data recording method capable of presenting a sub-picture at a proper timing in accordance with the kind of audio data to be reproduced.

Another object of the invention is to provide a data recording apparatus capable of presenting a sub-picture at a proper timing in accordance with the kind of audio data to be reproduced.

Another object of the invention is to provide a data reproducing method capable of presenting a sub-picture at a proper timing in accordance with the kind of audio data to be reproduced.

Another object of the invention is to provide a data reproducing apparatus capable of presenting a sub-picture at a proper timing in accordance with the kind of audio data to be reproduced.

According to the invention, there is provided a recording medium which comprises video data to be reproduced as a moving picture; first audio data to be reproduced along with the video data; first sub-picture data which can be presented along with the first audio data and can be selectively set in a presentation mode and a non-presentation mode in association with the first audio data; and control information for forcibly presenting the first sub-picture data in a predetermined time slot of a reproduction time sequence during which the first audio data is reproduced, even when the first sub-picture data is set in the non-presentation mode.

According to the invention, there is provided a recording method for a recording medium, which comprises a step of recording video data to be reproduced as a moving picture; a step of recording first audio data to be reproduced along with the video data; a step of recording first sub-picture data which can be presented along with the first audio data and can be selectively set in a presentation mode and a non-presentation mode in association with the first audio data; and a step of recording control information for forcibly presenting the first sub-picture data in a predetermined time slot of a reproduction time sequence during which the first audio data is reproduced, even when the first sub-picture data is set in the non-presentation mode.

According to the invention, there is provided a recording apparatus for a recording medium, which comprises means

for recording video data to be reproduced as a moving picture; means for recording first audio data to be reproduced along with the video data; means for recording first sub-picture data which can be presented along with the first audio data and can be selectively set in a presentation mode and a non-presentation mode in association with the first audio data; and means for recording control information for forcibly presenting the first sub-picture data in a predetermined time slot of a reproduction time sequence during which the first audio data is reproduced, even when the first sub-picture data is set in the non-presentation mode.

According to the in the invention, there is provided a reproducing apparatus for a recording medium which comprises video data to be reproduced as a moving picture, first audio data to be reproduced along with the video data, first sub-picture data which can be presented along with the first audio data and can be selectively set in a presentation mode and a non-presentation mode in association with the first audio data, and control information concerning presentation of the first sub-picture data, the apparatus comprising reproducing means for reproducing the video data, the first audio data and the first sub-picture data from the recording medium; selection means for selecting one of the presentation mode and non-presentation mode of the sub-picture data in the reproducing means; and control means for forcibly presenting the first sub-picture data in a predetermined time slot of a reproduction time sequence during which the first audio data is reproduced, even when the first sub-picture data is set in the non-presentation mode by the selection means, on the basis of the control information.

According to the invention, there is provided a reproducing method for a recording medium which comprises video data to be reproduced as a moving picture, first audio data to be reproduced along with the video data, first sub-picture data which can be presented along with the first audio data and can be selectively set in a presentation mode and a non-presentation mode in association with the first audio data, and control information concerning presentation of the first sub-picture data, the apparatus comprising a reproducing step of reproducing the video data, the first audio data and the first sub-picture data from the recording medium; a selecting step of selecting one of the presentation mode and non-presentation mode of the sub-picture data in the reproducing step; and a control step of forcibly presenting the first sub-picture data in a predetermined time slot of a reproduction time sequence during which the first audio data is reproduced, even when the first sub-picture data is set in the non-presentation mode on the basis of the control information in the selecting step.

In the invention, a control command is used for controlling reproduction and presentation of sub-picture data in the state where the sub-picture data is set in a non-presentation mode. The sub-picture data is reproduced and presented in a desired time slot of a reproduction time sequence during which the audio data is reproduced. For example, when the desired time slot is designated to be a period during which the audio data of a non-English conversation is reproduced, the sub-picture data of an associated English caption can be forcibly presented at the designated time slot. In addition, since the above-mentioned forcible presentation control is performed by using the sub-picture data which has been recorded along with the audio data on a recording medium, additional sub-picture data is not required for the non-English conversation. This saves the record capacity of the recording medium.

Accordingly, it is possible to record sets of audio data representing different language conversations and sets of sub-picture data representing associated language captions along with one set of video data on the recording medium. In this case, audio data identification number data is set in a field of the control command to select one of the sub-picture data sets which is associated with the audio data set identified by the number data. The selected sub-picture data set can be subjected to the forcible presentation control when it is confirmed that the identified audio data set coincides with the audio data set which is currently reproduced.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate a presently preferred embodiment of the invention and, together with the general description given above and the detailed description of the preferred embodiment given below, serve to explain the principles of the invention.

FIG. **1** is a block diagram schematically showing an optical disk apparatus according to an embodiment of the present invention;

FIG. **2** is a block diagram showing details of the mechanism of a disk drive section shown in FIG. **1**;

FIG. **3** is a perspective view schematically showing the structure of an optical disk loaded in the disk drive section shown in FIG. **1**;

FIG. **4** is an explanatory view illustrating the structure of a logical format of the optical disk shown in FIG. **3**;

FIG. **5** is an explanatory view illustrating the structure of a disk information file shown in FIG. **4**;

FIG. **6** is an explanatory view illustrating the structure of a file, such as a movie file or a music file, as shown in FIG. **4**;

FIG. **7** is an explanatory view illustrating the hierarchical structure of a video data area of the file shown in FIG. **6**;

FIG. **8** is an explanatory view showing 1GOP (Group of Pictures) constituting a video cell shown in FIG. **7**;

FIGS. **9A** and **9B** are explanatory views showing the structure of a pack shown in FIG. **8**;

FIG. **10** is an explanatory view showing the contents of disk search information described in the DSI pack shown in FIG. **8**;

FIG. **11** is an explanatory view showing parameters described in general information shown in FIG. **10**;

FIG. **12** is an explanatory view showing parameters described in reproduction sync information shown in FIG. **10**;

FIG. **13** is an explanatory view showing the structure of effect information shown in FIG. **10**;

FIG. **14** is an explanatory view showing the contents of an effect process command shown in FIG. **13**;

FIG. **15** is an explanatory view illustrating time control information concerning forcible presentation of a sub-picture;

FIG. **16** is an explanatory view illustrating time control information relating, like FIG. **15**, to forcible presentation of a sub-picture;

FIG. 17 is a functional block diagram concerning forcible presentation of a sub-picture;

FIG. 18 is an explanatory view illustrating the structure of data relating, like FIG. 17, to forcible presentation of a sub-picture;

FIG. 19 is a time chart relating, like FIG. 18, to forcible presentation of a sub-picture;

FIG. 20 is a block diagram of an encoder system for encoding video data, thereby producing a video file;

FIG. 21 is a flowchart illustrating an encoding process shown in FIG. 20;

FIG. 22 is a flowchart illustrating a process of producing a video data file by combining audio data, sub-picture data, and video data encoded in the encoding process of FIG. 21;

FIG. 23 is a block diagram showing a disk formatter system for recording the formatted video file on an optical disk;

FIG. 24 is a flowchart illustrating a logic data preparing process performed by the disk formatter system shown in FIG. 23; and

FIG. 25 is a flowchart illustrating a physical data preparing process performed by the disk formatter system shown in FIG. 23.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Hereinafter, referring to the accompanying drawings, an optical disk reproducing apparatus according to an embodiment of the present invention will be explained.

FIG. 1 is a block diagram of an optical disk reproducing apparatus that reproduces data from an optical disk associated with an embodiment of the present invention. FIG. 2 is a block diagram of a disk drive section that drives the optical disk shown in FIG. 1. FIG. 3 shows the structure of the optical disk shown in FIGS. 1 and 2.

As shown in FIG. 1, the optical disk reproducing apparatus comprises a key/display section 4, a monitor section 6, and a speaker section 8. When the user operates the key/display section 4, this causes the record data to be reproduced from an optical disk 10. The record data contains video (or movie) data, sub-picture data, and audio data, which are converted into video signals and audio signals. The monitor section 6 displays images according to the audio signals and the speaker section 8 generates sound according to the audio signals.

It is known that the optical disk 10 has various structures. For instance, one kind of the optical disk 10 is a read-only disk on which data is recorded with a high density as shown in FIG. 3. The optical disk 10, as shown in FIG. 3, is made up of a pair of composite layers 18 and an adhesive layer 20 sandwiched between the composite disk layers 18. Each of the composite disk layers 18 is composed of a transparent substrate 14 and a recording layer or a light-reflecting layer 16. The disk layer 18 is arranged so that the light-reflecting layer 16 may be in contact with the surface of the adhesive layer 20. A center hole 22 is made in the optical disk 10. Clamping areas 24 are provided at the periphery of the center hole 22 on both sides, of the disc, which are used to clamp the optical disk 10 during its rotation. When the disk 10 is loaded in the optical disk apparatus, the spindle of a spindle motor 12 shown in FIG. 2 is inserted into the center hole 22. As long as the disk is being rotated, it continues to be clamped at the clamping areas 24.

As shown in FIG. 3, the optical disk 10 has an information zone 25 around the clamping zone 24 on each side. The information zones allow the information to be recorded on the optical disk 10. In each information area 25, its outer circumference area is a lead-out area 26 in which no information is normally recorded, its inner circumference area adjoining the clamping area 24 is a lead-in area 27 in which no information is normally recorded, and the area between the lead-out area 26 and the lead-in area 27 is a data recording area 28.

At the recording layer 16 in the information area 25, a continuous spiral track is normally formed as an area in which data is to be recorded. The continuous track is divided into a plurality of physical sectors, which are assigned serial numbers. On the basis of the sectors, data is recorded. The data recording area 28 in the information recording area 25 is an actual data recording area, in which reproduction data, video data, sub-picture data, and audio data are recorded in the form of pits (that is, in the form of changes in the physical state), as will be explained later. With the read-only optical disk 10, a train of pits is formed in advance in the transparent substrate 14 by a stamper, a reflecting layer is formed by deposition on the surface of the transparent substrate 14 in which the pit train is formed, and the reflecting layer serves as the recording layer 16. In the read-only optical disk 10, a groove is normally not provided as a track and the pit train in the surface of the transparent substrate 14 serves as a track.

The optical disk apparatus 12, as shown in FIG. 1, further comprises a disk drive section 30, a system CPU section 50, a system ROM/RAM section 52, a system processor section 54, a data RAM section 56, a video decoder section 58, an audio decoder section 60, a sub-picture decoder section 62, and a D/A and data reproducing section 64.

As shown in FIG. 2, the disk drive section 30 contains a motor driving circuit 11, a spindle motor 12, an optical head 32 (i.e., an optical pickup), a feed motor 33, a focus circuit 36, a feed motor driving circuit 37, a tracking circuit 38, a head amplifier 40, and a servo processing circuit 44. The optical disk 10 is placed on the spindle motor 12 driven by the motor driving circuit 11 and rotated by the spindle motor 12. The optical head 32 that projects a laser beam on the optical disk 10 is located under the optical disk 10. The optical head 32 is placed on a guide mechanism (not shown). The feed motor driving circuit 37 supplies a driving signal to the feed motor 33. The motor 33 is driven by the driving signal and moves the optical head 32 across the radius of the optical disk 10. The optical head 32 is provided with an objective lens 34 positioned so as to face the optical disk 10. The objective lens 34 moves according to the driving signal supplied from the focus circuit 36 so as to move along its optical axis.

To reproduce the data from the above optical disk 10, the optical head 32 projects a laser beam on the optical disk 10 via the objective lens 34. The objective lens 34 is moved little by little across the radius of the optical disk 10 according to the driving signal supplied from the tracking circuit 38. Furthermore, the objective lens 34 is moved along its optical axis according to the driving signal supplied from the focusing circuit 36 so that its focal point is positioned on the recording layer 16 of the optical disk 10. This causes the laser beam to form the smallest beam spot on the spiral track (i.e., the pit train), enabling the beam spot to trace the track. The laser beam is reflected from the recording layer 16 and returned to the optical head 32. The optical head 32 converts the beam reflected from the optical disk 10 into an electric signal, which is supplied from the optical head 32 to the servo processing circuit 44 via the head amplifier 40. From the electric signal, the servo processing circuit 44 produces

a focus signal, a tracking signal, and a motor control signal and supplies these signals to the focus circuit **36**, tracking circuit **38**, and motor driving circuit **11**, respectively.

Therefore, the objective lens **34** is moved along its optical axis and across the radius of the optical disk **10**, its focal point is positioned on the recording layer **16** of the optical disk **10**, and the laser beam forms the smallest beam spot on the spiral track. Furthermore, the spindle motor **12** is rotated by the motor driving circuit **11** at a specific rotating speed. This allows the beam to track, for example, at a constant linear speed.

The system CPU section **50** of FIG. **1** supplies to the servo processing circuit **44** a control signal serving as an access signal. In response to the control signal, the servo processing circuit **44** supplies a head-moving signal to the feed motor driving circuit **37**, which supplies a driving signal to the feed motor **33**. Then, the feed motor **33** is driven, causing the optical head **32** to move across the radius of the optical disk **10**. Then, the optical head **32** accesses a specific sector formed at the recording layer **16** of the optical disk **10**. The data is reproduced from the specific sector by the optical head **32**, which then supplies it to the head amplifier **40**. The head amplifier **40** amplifies the reproduced data, which is outputted at the disk drive section **30**.

The reproduced data is transferred and stored in the data RAM section **56** by the system processor section **54** which is controlled by the system CPU section **50** operating in accordance with the programs stored in the system ROM/RAM section **52**. The stored reproduced data is processed at the system processor section **54**, which sorts the data into video data, audio data, and sub-picture data, which are then supplied to the video decoder section **58**, audio decoder section **60**, and sub-picture decoder section **62**, respectively, and are decoded at the respective decoder sections. The D/A and data-reproducing section **64** converts the decoded video data, audio data, and sub-picture data into an analog video signal and an analog audio signal, and supplies the resulting video signal to the monitor **6** and the resulting audio signal to the speaker **8**. Then, on the basis of the video signal and sup-picture signal, images are displayed on the monitor section **6** and according to the audio signal, sound is simultaneously reproduced at the speaker section **8**.

The structure of the logic format according to the initial version of the optical disk apparatus shown in FIG. **1** will now be described with reference to FIGS. **4** to **11**. The operation of the optical disk apparatus shown in FIG. **1** will be described in greater detail along with the logic format of the optical disk **10**.

FIG. **4** shows the structure of the logic format according to an initial version thereof. Specifically, a data recording region **28** beginning with the lead-in area **27** and ending with the lead-out area **26** on the optical disk **10** shown in FIG. **1** has a volume structure, as shown in FIG. **4**, conforming to a logic format of ISO9660. This volume structure comprises a hierarchical volume management information region **70** and a hierarchical file region **80**. The volume management information region **70** corresponds to logic block numbers **0** to **23** defined according to ISO9660. A system area **72** and a volume management area **74** are assigned to the volume management information region **70**. The system area **72** is normally an empty area and the contents thereof are not defined. For example, the system area **72** is provided for an editor for editing data to be recorded on the optical disk **10** or a person who provides a title. A system program for operating the optical disk apparatus according to the editor's intention is stored in the system area **72** on an as-needed basis. The volume management area **74** stores volume management information for managing a disk information file **76** in the file region **80** (hereinafter referred to simply as "disk information file **76**") and a file **78**, such as a movie file or a music file, i.e. data on the record positions, record capacities, file names, etc. of all files. Files **76** and **78** of file numbers **0** to **99** designated by logic block numbers beginning with **24** are provided in the file region **80**. The file **76** with file number **0** is assigned as disk information file **76**. The files **78** with file numbers from **1** to **99** are assigned as movie or video files or music files.

As is shown in FIG. **5**, the disk information file **76** comprises a file management information area **82** and a menu video data area **84**. The file management information area **82** stores file management information for selecting a selectable sequence, such as a video title or an audio title, recorded on the entire optical disk **10**. The menu video data area **84** stores, in the form of menu cells **90**, menu video data for displaying menus of selecting a title, etc. As will be described later in detail, the menu video data of the menu video data area **84** is divided into units of a size necessary for a purpose, i.e., an i-number of menu cells **90** sequentially numbered from #1 in the order in which the cells **90** are recorded on the menu video data area **84** on the disk **10**. The menu cells **90** have video data, sub-picture data or audio data concerning the selection of a movie title or an audio title, selection of programs for each title, etc.

As shown in FIG. **5**, the file management information area **82** comprises three information areas: a disk structure information area **86** for storing a disk structure information (DSINF), a menu structure information area **87** for storing menu structure information (MSINF), and a cell information table (MCIT) **88** for storing cell information. These three information areas are arranged in that order.

The disk structure information area **86** principally stores disk structure information, such as the number (expressed as parameter DSINF between numerals **1** and **99**) of movie files and music files, i.e., reproduction files **78**, recorded in the file region **80** of the disk **10**, the number of sequences (sets of video data, audio data and sub-picture data) being present within each file **78**, i.e. the number of titles (expressed as parameter FSINF), and sub-picture and audio information in each file. When the file **78** is, for example, a movie file, it is specified in the disk structure information that the file **78** is the movie file. When there is a number of audio streams, the number of audio streams, for example, two, and codes specifying that the audio streams are, for example, English-language and Japanese-language audio streams, are included in the disk structure information. In addition, the number of sub-picture channels and codes specifying that the sub-picture channels are, for example, English-language and Japanese-language captions (or subtitles), are included in the disk structure information.

The menu structure information area **87** stores menu structure information such as the total number (i.e. parameter NOMCEL) of menu cells **90** present in the menu video data area **84** of the disk information file **76**, a start cell number (i.e. parameter TMSCEL) assigned to an initial one of the menu cells **90** which are used to display a title menu, a start cell number specifying the initial one of menu cells **90** which are used to display an audio menu, a start cell number specifying the initial one of menu cells **90** which are used to display a sub-picture menu, and a start cell number specifying the initial one of menu cells **90** which are used to display a program menu.

The menu cell information table **88** is defined as an aggregation of an i-number of cell information areas **89**

which are provided in the order of cell numbers and have cell information necessary for reproduction of the menu cells **90**. If no video data for displaying a menu is present in the file **76**, the menu information table is not provided. The cell information table **88** has information concerning the position (i.e. parameter MCSLBN indicated by an offset logic block number from the beginning of the file) of the menu cell **90** in the file **76**, the size (i.e. parameter MCNLB indicated by the number of logic blocks), etc.

On the basis of the menu cell information and menu structure information (MSINF), each menu cell is selected to display a menu. When one of the selection items is selected on the displayed menu, a code of disk structure information is specified. For example, an audio stream No. #1 of an English speech is designated without a sub-picture of an English caption, or an audio stream No. #2 is designated with a sub-picture of a Japanese caption.

The disk structure information (DSINF) and menu structure information (MSINF) are successively provided in the file management information area **82**. The menu cell information table (MCIT) **88** is provided at a boundary of logic blocks.

Music data or movie data of one or more titles is stored in the movie files or music files **78** corresponding to file numbers **1** to **99**, as shown in FIG. **4**. Each file **78** has a file structure, as shown in FIG. **6**, comprising file management information area **101** storing information on the data contained in the file **78**, i.e. management information (e.g. address information, reproduction control information, etc.), and a video data area **102** storing moving video data (including video data, audio data and sub-picture data) in the file **78**. The video data area **102** stores moving video data in the form of video data cells **105**, like the menu cells **90** of the disk information file **76**, and the moving video data is divided into a j-number of video data cells **105**.

In general, movie data or audio data of a certain title is expressed as an aggregation of successive sequences **106**. For example, the story of a movie is expressed by successive sequences **106** corresponding to "introduction," "development," "turn," and "conclusion." Accordingly, the video data area **102** of each file **78** is defined as an aggregation of sequences **106**, as shown in FIG. **7**. Each sequence **106** is expressed by a plurality of video programs **107** corresponding to various scenes of the story. Each video program **107** is composed of a plurality of video data cells **105**. Each video data cell **105**, as shown in FIG. **8**, comprises a plurality of groups of pictures (GOP) in each of which a disk search information (DSI) pack **92**, a video pack **93**, a sub-picture pack **95** and an audio pack **98** are combined. The structure of the video cell **105** is substantially the same as that of the menu cell **90**. The video data **102** consists of movie data, audio data, sub-picture data, etc., which have been compressed according to a compression standard of, e.g. MPEG1 (Moving Picture Expert Group) or MPEG2 and recorded in a data format corresponding to a system layer of MPEG2. Specifically, the video data **102** is a stream of programs defined by the MPEG standard. Further, each of the packs **92**, **93**, **95** and **98** has a pack structure formed of a pack header **97** and a packet **99** corresponding to the pack. More specifically, there are two types of packs **92**: a pack **92N** shown in FIG. **9A** in which a padding packet is not inserted, and a pack **92P** shown in FIG. **9B** in which a padding packet is inserted in order to adjust the length of the pack to 2048 bytes (one logic sector). Normally, adjustment is made by adding a stuffing byte to the pack header **97** when the number of data items to be adjusted is 7 bytes or less, and by adding a padding packet when the number of data items to be adjusted is 8 bytes or more.

In each pack, a pack start code, a system clock reference (SCR) value, a multiplexed rate and a stuffing is provided as the pack header **97**; and a video packet, an audio packet, a sub-picture packet, a disk search pack such as a DSI packet are provided according to the kind of the pack as the packet **99** successive to the packet **97**. As will be described in greater detail, the SCR value is referred to by the system CPU section **50** as a time based on which an absolute time of a timer provided within the optical disk apparatus, i.e. a system time clock (STR), is referred to, thereby executing transfer of data packets, etc.

A video data decoding time stamp (DTS) for expanding MPG-compressed video data at the aforementioned time and a presentation time stamp (PTS) for outputting the decoded video data from the decoder section at the aforementioned time are provided in the packet **99** of the first video pack within one GOP. The decoding time stamp DTS is compared with the system time clocks in the decoder sections **58**, **60** and **62** and the packet **99** is decoded by decoder sections **58**, **60**, and **62**. The presentation time stamp PTS is compared with the system time clock within the D/A and data reproducing section **64** and decoded and the decoded data is subjected to a reproducing process in the D/A and data reproducing section **64**.

The file management information area **101** comprises a file management table (FMT) **113**, a sequence information table (SIT) **114**, a cell information table (CIT) **115** and a disk search map (DSM).

The video data cells in the video data area **102** shown in FIG. **6** are assigned sequential numbers from #1 in the order of record on the disk, and the cell numbers and cell information associated with the cell numbers are provided on the cell information table **115**. Specifically, the cell information table **115** is defined as an aggregation of areas **117** storing a j-number of cell information (CI) items which are necessary for reproduction of the video data cells and arranged in the order of the cell numbers. The cell information (CI) includes information concerning the position, size, reproduction time, etc. of the cell within the file **78**.

The sequence information table **114** is defined as an aggregation of areas **116** for storing an i-number of sequence information (SI) items representing, for example, the order of selecting and reproducing the cells **105** in a range designated for each sequence **106**. Each sequence information (SI) item contains reproduction control information concerning the reproducing order and the reproduction of video cells **105** recorded in the sequence **106**.

The sequences **106** are classified into two types: a completion-type sequence which is completed by a single sequence, and a connection-type sequence which is branched and connected to the next sequence. Connection-type sequences include: a connection-type head sequence which is a head sequence of video data corresponding to a multi-story and can be branched and connected to the next sequence, i.e. a connection-type head sequence in which the story varies according to the manner of choice of the story; a connection-type intermediate sequence which is a branch of another connection-type sequence and is connected to still another sequence; and a connection-type end sequence which is connected to another connection-type sequence and is completed, i.e. a connection-type end sequence with which the story is completed. Sequence numbers **1** to i are assigned to these sequence information items. The start point information of each sequence information item is written on the file management information table **113**.

The file management table (FMT) **113** shows various information concerning the video file **78**. The file manage-

ment table **113** stores the name of the file and an identifier for determining whether or not the file can be reproduced by the optical disk reproducing apparatus in which the optical disk is mounted. The file identifier has, for example, an identifier for identifying a movie file. The file management table **113** also stores the start addresses of the sequence information table **114** and cell information table **115**, the number of sequence information items and the number of cell information items stored in these tables, the start address of each sequence indicated by an offset logic block from the start of the sequence information table **114**, the start address of the video data in the video data area **102**, and data attributes serving as information required for reproducing each data.

As has been described with reference to FIG. **8**, the disk search information pack (DSI pack) **92** is included in a top portion of the 1GOP of video data. In the disk search information pack (DSI pack) **92**, as shown in FIG. **10**, various information items concerning reproduction of the 1GOP are stored. Specifically, the DSI pack **92** contains general information shown in FIG. **11**, reproduction sync information of 1GOP shown in FIG. **12**, position information of the DSI, i.e. address information, and effect information concerning various effects occurring in a reproduction time period of 1GOP, such as effect commands which will be described with reference to FIGS. **13** and **14**.

In the effect information of the disk search information pack (DSI pack) **92**, process commands as shown in FIGS. **13** and **14** and the start time and end time of the process commands shown in FIG. **13** serving as offset presentation time stamps (EFTS) for the effects, are described. The EFTS is defined as offset time from an absolute time represented by the video start presentation time stamp VSPTS contained in the reproduction sync information. The start time is [(VSPTS/90000)+(description value/45000)] sec. The process commands include a command for forcibly starting presentation of a sub-picture from the start time of a specific audio stream, i.e. from the first frame after the EFTS, and a command for forcibly stopping presentation of a sub-picture from the end time of a specific audio stream, i.e. from the first frame after the EFTS.

Specifically, when a specific audio stream, e.g. an English audio stream of audio stream No. #1, is selected, commands for executing and ending special reproduction (EFTS) are described. The special reproduction is required, for example, when a scene in which a protagonist is speaking English has been switched to a scene in which he speaks French with a French-speaking person. In this case, special effect (EFTS) is executed at the time the English conversation has been switched to the French conversation after the start of a certain audio stream, and an English caption is forcibly presented as sub-picture. The special reproduction is also required, for example, when an English-speaking protagonist takes a medicine in a drugstore and views the label of the medicine. In this case, an English caption is forcibly presented as sub-picture to indicate the name of the medicine. The commands for the special reproduction process include a command for causing no effect process to be executed.

In FIG. **14**, the effect process command is shown as a sub-picture presentation control command formed of five bytes. The upper four bytes are assigned to a field for designating the time for executing the sub-picture presentation control command. Upper four bits of the fifth byte from the upper most byte are assigned to a field for designating forcible start (represented by "0100") or forcible stop (represented by "0101") of presentation by the sub-picture presentation control command. Lower four bits of the fifth byte from the upper most byte are assigned to a field for designating the kind (language No.) of audio data to execute the command only during reproduction of the designated audio data. In this case, one selected from 16 kinds of audio data can be designated for reproduction. A selection number for designating all kinds of audio data (represented by "0000") is also provided. When all kinds of audio data have been designated, a sub-picture is forcibly presented even if any of audio streams is reproduced.

As is shown in FIG. **11**, in the general information, a system clock reference (SCR) value which should be referred to by the disk search information pack (DSI pack) **92** is described as parameter DSCR, and a presentation time stamp (PTS) representing timing for reproducing the 1GOP is described as parameter VSPTS. Thus, when the system time clock (STC) of the apparatus coincides with the system clock reference (SCR) value described in the pack header **97** of the disk search information pack (DSI pack) **92**, the packet **99** of the DSI pack **92** is transferred to the system CPU section **50**. At this time, the pack header **97** of the DSI pack **92** is separated from the packet **99** to transfer the packet **99** alone to the system CPU section **50**. The parameter DSCR represents the time, at which the packet **99** of the DSI pack **92** has been transferred, and is referred whenever necessary. The timing for reproducing 1GOP (1 Group of Pictures) is specified by the time stamp (VSPTS). The general information also includes a logic block number (DLBN) of the DSI pack and a cell number (CELN).

In the reproduction sync information, a presentation time stamp (PTS: parameter VPTS) representing the time for reproducing an intra-picture (I-picture) from the MPEG-compressed video packs **93** is described as an offset PTS from VSPTS. In addition, in the reproduction sync information, an address (parameter VPSA) of the video pack **93** including the I-picture is described as an offset logic block number from the DSI pack. A presentation time stamp PTS (parameter APTS) for reproducing audio data from audio packs is described as an offset PTS from VSPTS. The parameter APTS is a PTS of an audio packet having a closest reproduction start time after the reproduction start time of the I-picture. The description area is prepared for 8 streams corresponding to audio stream numbers **#1** to **#8**. Furthermore, in the reproduction sync information, an address (parameter APSA **0–7**) of the audio pack **98** specified by the APTS is described as an offset logic block from the DSI pack. In the reproduction sync information, a presentation time stamp PTS (parameter SPPTS **0–31**) of a sub-picture unit comprising sub-picture packs **93** reproduced in the GOP reproduction time period is described as an offset PTS from VSPTS. The description area for this is prepared for 32 streams associated with sub-picture stream numbers **#1** to **#32**. Besides, in the reproduction sync information, an address (parameter APSA **0–31**) of the sub-picture audio pack **98** specified by the SPPTS is described as an offset logic block from the DSI pack.

Referring back to FIG. **1**, the operation for reproducing movie data from the optical disk **10** having the logic format shown in FIGS. **4** to **6** will now be described. In FIG. **1**, solid-line arrows between the blocks indicate data buses, and broken-line arrows indicate control buses.

In the optical disk apparatus shown in FIG. **1**, when power is supplied, the system CPU section **50** reads out an initial operation program from the system ROM/RAM section **52** and activates the disk drive section **30**. The disk drive section **30** starts a read-out operation from the lead-in area **27** and reads out volume management information from the

volume management information area **74** of the volume management information region **70** following the lead-in area **27**. Specifically, the system CPU section **50** delivers a read command to the disk drive section **30** in order to read out the volume management information from the volume management information area **74** recorded on a predetermined position on the disk **10** set in the disk drive section **30**. Thus, the system CPU section **50** reads out the volume management information and temporarily stores the read-out information in the data RAM section **56** via the system processor section **54**. The system CPU section **50** extracts, from the volume management information data sequence stored in the data RAM section **56**, necessary management information such as the record position of each file, the record capacity, etc. The extracted information is transferred and saved in a predetermined location in the system ROM/RAM section **52**.

The system CPU section **50** refers to the previously obtained information on the record position of each file, the record capacity, etc. in the system ROM/RAM section **52**, and obtains the disk information file **76** corresponding to the file number **0**. Specifically, the system CPU section **50** refers to the previously obtained information on the record position of each file, the record capacity, etc. in the system ROM/RAM section **52**, delivers a read command to the disk drive section **30**, reads out file management information of the disk information file **76** with the file number **0**, and stores the read-out information in the data RAM section **56** via the system processor section **54**. Similarly, the obtained information is transferred and saved in a predetermined location in the system ROM/RAM section **52**.

The system CPU section **50** makes use of the disk structure information **86**, menu structure information **87** and menu cell information table **88** of the file management information in the disk information file **76** and reproduces and presents on the screen the sequence (title) selection menu cell of the menu video data **84**. The user selects a sequence (title) to be reproduced, audio data of the title and sub-picture of the title by the key/display section **4** on the basis of the selection numbers displayed on the menu screen. Thereby, the file number, sequence information and audio stream belonging to the selected sequence are specified. The audio stream to be selected is, for example, an English audio stream corresponding to audio stream **#1**, a Japanese audio stream corresponding to audio stream **#2**, etc. The sub-picture to be selected is, for example, an English caption or a Japanese caption. When audio data of a movie story is English, no sub-picture is normally presented unless an English caption is selected by the sub-picture selection, except for the case where a sub-picture is presented by special reproduction, as will be described later.

The operation until the designated video file **78** is acquired and the video data **102** is reproduced will now be described. In order to acquire the sequence information associated with the designated sequence number, the information on the record position and record capacity of each video file **78** is obtained from the volume management information **74** and is used. At first, the file management information **101** of the video file **78** belonging to the sequence to be reproduced is read out, as in the case of the disk information file **76**, and stored in the data RAM section **56**.

The system CPU section **50** obtains the sequence information corresponding to the designated sequence number from the sequence information table **114** of the file management information **101** stored in the data RAM section **56**. The obtained data and the cell information **117** in the cell information table **115** necessary for reproducing the sequence are transferred and stored in the system ROM/RAM section **52**.

The cell information on the cell which is to be first reproduced is obtained from cell reproduction order information in the thus acquired sequence information. On the basis of the video data reproduction start address and size data in the cell information, a read command for reading from a target address is delivered to the disk drive section **30**. The disk drive section **30** drives the optical disk **10** according to the read command and reads the data of the target address from the optical disk **10**. The read-out data is sent to the system processor section **54**. The system processor section **54** temporarily stores the sent data in the data RAM section **56** and determines the kind of data (video, audio, sub-picture, reproduction information, etc.) on the basis of header information added to the stored data. The data is transferred to the decoder section **58**, **60** or **62** associated with the kind of the data.

Each decoder section **58**, **60**, **62** decodes the data according to the data format and sends the decoded data to the D/A and data reproducing section **64**. The D/A and data reproducing section **64** converts the decoded digital signal to an analog signal and subjects the analog signal to a mixing process. The resultant signal is output to the monitor section **6** and speaker section **8**.

In the process of determining the kind of data, if data is reproduction information representing the reproduction position of video data, etc., the reproduction data is not transferred and is stored in the data RAM section **56**. The reproduction information is referred to by the system CPU section **50** on an as-needed basis and is used for monitoring in video data reproduction.

A description will now be given of the case where the menu cell has been acquired and the menu screen has been displayed and the user has selected an English audio stream corresponding to audio stream **#1** as audio data of a title and selected no sub-picture of the title.

If the title is selected, the file **78** corresponding to the title is stored in the RAM **56**. From the stored file **78**, the file management information **101** of the file **78** is transferred to the system ROM/RAM section **52**. Based on the transferred information **101**, the data cells **105** are read out successively. As has been described above, the data cell **105** is an aggregation of GOPs (Groups of Pictures). Thus, the data cell **105** is transferred from the data RAM **56** to the system processor section **54** in units of GOP, and the video data, audio data and sub-picture data are transferred to the associated decoder sections **58**, **60** and **62**.

At first, the disk search information pack (DSI pack) **92** at the top of the GOP is read out from the data RAM **56** on the basis of the file management information **101**. In the pack header **97** of the disk search information pack (DSI pack) **92**, the system clock reference (SCR) value is described as general information. If the time represented by the parameter SCR coincides with the system time clock STC representing the reference time of the system CPU **50**, etc., the packet **99** of the DSI pack **92** is transferred to the system CPU **50**, as shown in FIG. **15**. Specifically, as shown in FIG. **15**, the contents of the packet **99**, i.e. the reproduction timing stamp (VSPTS) of the GOP, I-picture PTS (VPTS), sub-picture PTS (SPSPTS) corresponding to the start time of sub-picture PTS (SPPTS), sub-picture PTS (SPEPTS) corresponding to the stop time of sub-picture PTS (SPPTS), audio PTS (APTS), effect process command, the start time of the effect process command (EFT), and the stop

time (EFT) of the effect process command, are transferred to the system CPU 50. Thus, the system CPU 50 manages the transfer/reproduction of the video packs 93, sub-picture pack 95 and audio pack 98 following the DSI pack 92 from the data RAM 56 to the decoder sections 58, 60 and 62 via the system processor section 54. Specifically, if the system clock reference (SCR) of each pack 92 coincides with the system time clock (STC) of the apparatus in the system CPU 50, i.e. if it is determined that the presentation time stamp (VSPTS) coincides with the SCR described in the pack header of the video packet 93, the packet 99 of the video pack 93 is transferred from the data RAM 56 to the decoder section 58 via the system processor section 54. Similarly, following the video pack 93, the packets 99 of the video pack 95 and audio pack 98 are transferred from the data RAM 56 to the associated decoder sections 60 and 62 via the system processor section 54.

Furthermore, if the decoding time stamp (DTS) described in the packet header of the video pack 93 coincides with the system time clock (STC), the system CPU 50 enables the decoder section 58 to expand, i.e. unpack, the picture, B-picture, etc. in the MPEG-compressed packet 99 of the video pack 93. In addition, the system CPU 50 lets the decoder section 58 output the expanded video data to the monitor 6 via the D/A and data reproducing section 64 at the time point of the I-picture PTS (VPTS) described as offset time from the presentation time stamp (VSPTS), as shown in FIG. 16.

Similarly, if the decoding time stamp (DTS) described in the pack header of the video pack 93 coincides with the system time clock (STC), the system CPU 50 enables the decoder section 60 to expand, i.e. unpack, the audio data, etc. in the compressed packet 99 of the audio pack 98. In addition, the system CPU 50 lets the decoder section 60 output the expanded video data to the speaker 8 via the D/A and data reproducing section 64 at the time point of the audio PTS (APTS) described as offset time from the presentation time stamp (VSPTS), as shown in FIG. 16. By the output of the video data and audio data, the monitor 6 displays a moving picture and the speaker 8 outputs audio sound and background sound accompanying the moving picture. Since the English audio stream is selected, as mentioned above, a sub-picture is not presented on the monitor 6 in the normal movie reproduction.

Similarly, the system CPU 50 enables the decoder section 62 to expand, i.e. unpack, the sub-picture data, etc. in the compressed packet 99 of the sub-picture pack 95 between the sub-picture PTS time (SPSPTS) described as offset time from the presentation time stamp (VSPTS) and the sub-picture PTS time (SPEPTS), as shown in FIG. 16. Since the English stream is selected as audio stream, however, the sub-picture is not output to the monitor 6 from the D/A and data reproducing section 64 and the English caption is not presented. In the case of a scene displayed on the monitor 6 in which the protagonist switches English conversation to French conversation, the system CPU 50 manages the switching time of conversion as time for the special effect (EFT), as described above. Accordingly, the output from the D/A and data reproducing section 64 to the monitor 6 is released from the forcible presentation time (EFTS) of special presentation PTS for starting special effect (EFT), which is described as offset time from the presentation time stamp (VSPTS). Thus, the monitor 6 presents the English caption in the scene of French conversation. When the protagonist switches the French conversation to the English conversation, the system CPU 50 similarly manages the switching time of conversion as time for the special effect (EFT). Specifically, the output from the D/A and data reproducing section 64 to the monitor 6 is stopped from the forcible presentation time (EFTS) of special presentation PTS for stopping special effect (EFT), which is described as offset time from the presentation time stamp (VSPTS). Thus, the monitor 6 stops the forcible presentation of the English caption. As is clear from FIG. 16, when the English stream is selected as audio stream, the forcible presentation time period is limited to a portion of the sub-picture presentation time period. Apart from the switching of the language of conversation, if there is a scene in which an English-speaking protagonist holds a medicine in a drugstore and views the German-language label on the medicine, an English sub-picture corresponding to the German-language label can be temporarily presented similarly.

The concept of the forcible sub-picture presentation based on the special effect (EFT) will now be briefly described once again with reference to the functional blocks shown in FIGS. 17 to 19. As already described, the streams of audio data and sub-picture data with the presentation timing information (parameters VSPTS, VPTS, SPETS, APTS, EFTS, etc.) shown in FIG. 17 are reproduced from the optical disk 10 as packs 95 and 98. Record data shown in FIG. 17 includes three audio data streams (Audio-1, Audio-2, Audio-3) and sub-picture data streams (SP-1, SP-2, SP-3) associated with the audio data streams, as shown in FIG. 18. For example, the sub-picture data streams contain a Japanese caption, a German caption and a French caption. An additional sub-picture data stream (SP-4) is recorded as, e.g. an English caption. In addition, a sub-picture presentation control command 104 is recorded on the optical disk 10. The sub-picture presentation control command 104 precedes the sub-picture data stream (SP-1) and audio data stream (Audio-1) which are reproduced at time (1) and is executed at time (1) corresponding to EFT. The sub-picture presentation control command 104 includes a presentation control time 105, an audio data number 107 and a presentation control kind 109. The audio data stream (Audio-1) includes an audio data presentation timing 121, an audio data number 123 and audio data 125. The sub-picture data stream (SP-1) includes a sub-picture data presentation timing 117, a sub-picture data number 119 and sub-picture data 131.

In the reproducing apparatus, the audio data selection number 101 and sub-picture data selection number 102 are set on the menu, and supplied to functioning blocks serving as comparators 110 and 112 which compare the selection numbers 101 and 102 with the data numbers 123 and 119, respectively. The reproducing apparatus reads an audio data stream whose audio data number 119 coincides with the audio data selection number 101 and a sub-picture data stream whose sub-picture number data 119 coincides with the sub-picture selection number 101, and reproduces the data streams at the reproduction time indicated therein.

FIG. 19 is a timing chart showing the relationship between the output of the reproducing apparatus and the presentation control. In the example represented by this timing chart, sub-picture presentation is stopped while the audio data in which German is mixed in English is being reproduced. Until the sub-picture presentation control command has been read, the reproducing apparatus cannot determine at what time a sub-picture should be forcibly presented. Even if decoding is started after the presentation start time is determined, presentation of a sub-picture may not be effected in time. Thus, when the sub-picture presentation is stopped, the decoding process of the sub-picture data of the same kind as audio data is always performed (step 1). At the presentation start time designated by the

sub-picture presentation control command (step 2), the sub-picture presentation output is enabled (step 3) and the sub-picture forcible presentation is achieved. Similarly, the sub-picture presentation is forcibly stopped at the presentation end time designated by the sub-picture presentation control command (steps 4 and 5) by disabling the sub-picture presentation output (step 6).

With reference to FIGS. 20 to 25, a description will now be given of the video data with the format shown in FIGS. 4 to 13, a method of recording the video data on the optical disk 10 to be reproduced, and a recording system to which the recording method is applied.

FIG. 20 shows an encoder system for generating a video file by encoding video data. In the system shown in FIG. 20, sources of video data, audio data and sub-picture data are, for example, a video tape recorder (VTR) 201, an audio tape recorder (ATR) 202 and a sub-picture source 203. These sources generates video data, audio data and sub-picture data under control of a system controller (SYS CON) 205. These data items are supplied to a video encoder (VENC) 206, an audio encoder (AENC) 207 and a sub-picture encoder (SPENC) 208. Under control of the system controller (SYS CON) 205, these data items are A/D converted by the encoders 206, 207 and 208 and encoded by respective compression methods. The encoded video data, audio data and sub-picture data (COMP VIDEO, COMP AUDIO, COMP SUB-PICT) are stored in memories 210, 211 and 212. The video data, audio data and sub-picture data (COMP VIDEO, COMP AUDIO, COMP SUB-PICT) are output to a file formatter (FFMT) 214 by the system controller (SYS CON) 205 and converted to the video data file structure of the above-described system. The information on the setting condition, attributes, etc. of each data item is stored as a file in a memory 216 by the system controller (SYS CON) 205.

A standard control flow of an encoding process in the system controller (SYS CON) 205 for preparing a file from video data will now be described.

According to the flow illustrated in FIG. 21, the video data and audio data are encoded and the encoded video data and audio data (COMP VIDEO, COMP AUDIO) are produced. Specifically, when the encoding process is started, necessary parameters for encoding the video data and audio data are set (step S70 in FIG. 21). Some of the set parameters are saved in the system controller (SYS CON) 205 and used in the file formatter (FFMT) 214. In step S71, the parameters are used to pre-encode the video data and calculate an optimal code amount distribution. In step S72, based on the code amount distribution obtained by the pre-encoding, the video data is encoded. At this time, the audio data is also encoded. In step S73, if necessary, the video data is partially re-encoded and the re-encoded video data is substituted. Through the series of steps, the video data and audio data are encoded. In steps S74 and S75, the sub-picture data is encoded and encoded sub-picture data (COMP SUB-PICT) is produced. Specifically, when the sub-picture data is encoded, necessary parameters are similarly set. In step S74, some of the set parameters are saved in the system controller (SYS CON) 205 and used in the file formatter (FFMT) 214. Based on the parameters, the sub-picture data is encoded. By this process the sub-picture data is encoded.

According to the flow illustrated in FIG. 22, the encoded video data, audio data and sub-picture data (COMP VIDEO, COMP AUDIO, COMP SUB-PICT) are combined and converted to a video data file structure as described with reference to FIG. 6. Specifically, in step S76, the cell 105 is set as minimum stream of video data and the cell information table (CIT) 115 is produced. Then, in step S77, the structure of cells 105 constituting the sequence 106, video attributes, sub-picture attributes and audio attributes are set (information obtained at each data encoding operation is used as part of the attribute information). The file management information (FMI) including the cell information table (CIT) 115 is prepared. The encoded video data, audio data and sub-picture data (COMP VIDEO, COMP AUDIO, COMP SUB-PICT) are divided into predetermined packs. Each data cell is arranged by inserting the control pack (DSI) 92 into each 1GOP so that the data can be reproduced in the order of data time codes. Thus, as shown in FIGS. 5 and 6, the data is formatted in the structures of the disk information file 76 and the files 78 such as movie files.

FIG. 23 shows a disk formatter system for recording the above-described formatted files 76 and 78 on the optical disk. As shown in FIG. 23, in this disk formatter system, file data is supplied to a volume formatter (VFMT) 226 from memories 220 and 222 storing the prepared information file 76 and files 78 such as movie files. In the volume formatter (VFMT) 226, the disk volume information 74 is added to the files 76 and 78 in the order shown in FIG. 4. Thus, logic data to be recorded on the disk 10 is prepared. Error correction data is added to the logic data prepared in the volume formatter (VFMT) 226 in a disk formatter (DFMT) 228, and thus the logic data is re-converted to physical data to be recorded on the disk. In a modulator 230, the physical data prepared by the disk formatter (DFMT) 228 is converted to record data to be actually recorded on the disk. The modulated record data is recorded on the disk 10 by a recorder 232.

FIGS. 24 and 25 illustrate standard flows for preparing the above-described disk. FIG. 24 shows a flow for preparing the logic data to be recorded on the disk 10. Specifically, in step S80, parameter data such as the number of video data files, the order of arrangement of the files, the size of each video data file, etc. are set at first. In step S81, volume information is prepared from the set parameters and file management information of each video data file. Thereafter, in step S82, the volume information and video data files are arranged in this order with the associated logic block numbers. Thus, the logic data to be recorded on the disk 10 is prepared.

Subsequently, the flow shown in FIG. 25 for preparing the physical data to be recorded on the disk is executed. Specifically, in step S83, the logic data is divided into a predetermined number of bytes, and error correction data is generated. In step S84, the logic data divided into the predetermined number of bytes and the generated error correction data are combined, thereby producing physical sectors. Then, in step S85, the physical sectors are combined to prepare the physical data.

The physical data generated by the flow of FIG. 25 is subjected to a modulating process based on predetermined rules. Thus, the recording data is prepared. Then, the record data is recorded on the disk 10.

In the above-described embodiment, a high-density recording optical disk is adopted as recording medium. The present invention, however, is applicable to recording mediums other than the optical disk, for example, a magnetic disk or other recording mediums physically capable of high-density recording.

By using commands for controlling reproduction presentation, sub-picture can be freely presented in accordance with reproduced audio data and the associated reproduction time. Furthermore, only one sub-picture data stream is needed for one audio data stream.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative devices, and illustrated examples shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.

What is claimed is:

1. A recording medium comprising:

video data to be reproduced as a moving picture;

first audio data to be reproduced along with said video data, said first audio data being in a first language;

first sub-picture data which is adapted to be presented along with said first audio data and that is selectively set in one of a presentation mode and a non-presentation mode in association with said first audio data, said first sub-picture data presenting sub-picture information in said first language; and

control information for forcibly presenting without user's intervention said first sub-picture data in a predetermined time slot of a reproduction time sequence during which said first audio data is reproduced, even if said first sub-picture data is set in said non-presentation mode so that said first sub-picture information is presented without using additional sub-picture data associated with said first language duplicating said first sub-picture data.

2. The recording medium according to claim 1, wherein said control information includes first timing information for designating a time for preparing presentation of said first sub-picture data, second timing information for designating a time for starting a presentation of said first sub-picture data, and third timing information for designating a time for terminating said presentation of said first sub-picture data.

3. The recording medium according to claim 1, wherein said control information is located on said recording medium such that said control information is reproduced prior to said first audio data.

4. The recording medium according to claim 1, wherein second audio data to be reproduced along with said video data is recorded on the recording medium in addition to said first audio data, and said control information includes a first field holding a command for controlling presentation of said first sub-picture data only while said first audio data is being reproduced, a second field designating which one of a start and a termination of said presentation should be controlled by said command, and a third field designating a timing for executing said command.

5. The recording medium according to claim 1, wherein second sub-picture data which can be presented along with said first audio data and can be selectively set in one of a presentation mode and in a non-presentation mode in association with said first audio data is recorded in addition to said first sub-picture data.

6. A recording method for a recording medium, comprising the steps of:

recording video data to be reproduced as a moving picture;

recording first audio data to be reproduced along with said video data, said first audio data being in a first language;

recording first sub-picture data which can be presented along with said first audio data and which can be selectively set in one of a presentation mode and a non-presentation mode in association with said first audio data, said first sub-picture data presenting sub-picture information in said first language; and

recording control information for forcibly presenting without user's intervention said first sub-picture data in a predetermined time slot of a reproduction time sequence during which said first audio data is reproduced, even if said first sub-picture data is set in said non-presentation mode so that said first sub-picture information is presented without using additional sub-picture data associated with said first language duplicating said first sub-picture data.

7. The recording method according to claim 6, wherein said control information includes first timing information for designating a time for preparing presentation of said first sub-picture data, second timing information for designating a time for starting a presentation of said first sub-picture data, and third timing information for designating a time for terminating said presentation of said first sub-picture data.

8. The recording method according to claim 6, wherein said control information is located on said recording medium such that said control information is reproduced prior to said first audio data.

9. The recording method according to claim 6, wherein second audio data to be reproduced along with said video data is recorded on the recording medium in addition to said first audio data, and said control information includes a first field holding a command for controlling presentation of the first sub-picture data only while said first audio data is being reproduced, a second field designating which one of a start and a termination of said presentation should be controlled by the command, and a third field provided for designating a timing for executing said command.

10. A recording apparatus for recording medium, comprising:

means for recording video data to be reproduced as a moving picture;

means for recording first audio data to be reproduced along with said video data, said first audio data being in a first language;

means for recording first sub-picture data which can be presented along with said first audio data and which can be selectively set in one of a presentation mode and a non-presentation mode in association with said first audio data, said first sub-picture data presenting sub-picture information in said first language; and

means for recording control information for forcibly presenting without user's intervention said first sub-picture data in a predetermined time slot of a reproduction time sequence during which said first audio data is reproduced, even if said first sub-picture data is set in said non-presentation mode so that said first sub-picture information is presented without using additional sub-picture data associated with said first language duplicating said first picture data.

11. The recording apparatus according to claim 10, wherein said control information includes first timing information for designating a time for preparing presentation of said first sub-picture data, second timing information for designating a time for starting a presentation of said first sub-picture data, and third timing information for designating a time for terminating said presentation of said first sub-picture data.

12. The recording apparatus according to claim 10, wherein said control information is located on said recording medium such that said control information is reproduced prior to first audio data.

13. The recording apparatus according to claim 10, wherein said apparatus further comprises means for recording, in addition to said first audio data, second audio data to be reproduced along with said video data, and said control information includes a first field holding a command for controlling presentation of said first sub-picture data only while said first audio data is being reproduced, a second field designating which one of a start and a termination of said presentation should be controlled by said command, and a third field provided for designating a time for executing said command.

14. A reproducing apparatus for a recording medium which comprises video data to be reproduced as a moving picture, first audio data to be reproduced along with said video data, said first audio data being in a first language, first sub-picture data which can be presented along with said first audio data and can be selectively set in one of a presentation mode and a non-presentation mode in association with said first audio data, said first sub-picture data presenting sub-picture information in said first language, and control information concerning presentation of said first sub-picture data, comprising:

reproducing means for reproducing said video data, said first audio data and said first sub-picture data from said recording medium;

selection means for selecting one of said presentation mode and said non-presentation mode of said sub-picture data in said reproducing means; and

control means for forcibly presenting without user's intervention said first sub-picture data in a predetermined time slot of a reproduction time sequence during which said first audio data is reproduced, even if said first sub-picture data is set in said non-presentation mode based on said control information so that said first sub-picture information is presented without using additional sub-picture data associated with said first language duplicating said first sub-picture data.

15. The reproducing apparatus according to claim 14, wherein said control information includes first timing information for designating a time for preparing presentation of said first sub-picture data, second timing information for designating a time for starting a presentation of said first sub-picture data, and third timing information for designating a time for terminating said presentation of said first sub-picture data, said control means includes means for controlling said reproducing means based on said first, second and third timing information.

16. The reproducing apparatus according to claim 14, wherein said control information is located on said recording medium such that said control information is reproduced prior to said first audio data.

17. The reproducing apparatus according to claim 14, wherein second audio data to be reproduced along with said video data is recorded in addition to said first audio data, and said control information includes a first field holding a command for controlling presentation of said first sub-picture data only while said first audio data is being reproduced, a second field provided for designating which one of a start and a termination of said presentation should be controlled by said command, and a third field provided for designating a timing of executing said command.

18. The reproducing apparatus according to claim 14, wherein second sub-picture data which can be presented along with said first audio data and can be selectively set in one of a presentation mode and in a non-presentation mode in association with said first audio data is recorded in addition to said first sub-picture data, and said control means is capable of selecting one of said first and said second sub-picture data.

19. A reproducing method for a recording medium which comprises video data to be reproduced as a moving picture, first audio data to be reproduced along with said video data, said first audio data being in a first language, first sub-picture data which can be presented along with said first audio data and can be selectively set in one of a presentation mode and a non-presentation mode in association with said first audio data, said first sub-picture data presenting sub-picture information in said first language, and control information concerning presentation of said first sub-picture data, comprising:

a reproducing step of reproducing said video data, said first audio data and said first sub-picture data from said recording medium;

a selecting step of selecting one of said presentation mode and said non-presentation mode of said sub-picture data in said reproducing step; and

a control step of forcibly presenting without user's intervention said first sub-picture data in a predetermined time slot of a reproduction time sequence during which said first audio data is reproduced, even if said first sub-picture data is set in said non-presentation mode based on said control information so that said first sub-picture information is presented without using additional sub-picture data associated with said first language duplicating said first sub-picture data.

20. The reproducing method according to claim 19, wherein said control information includes first timing information for designating a time for preparing presentation of said first sub-picture data, second timing information for designating a time for starting a presentation of said first sub-picture data, and third timing information for designating a time for terminating the presentation of said first sub-picture data, said control step includes means for controlling said reproducing step based on said first, second and third timing information.

21. The reproducing method according to claim 19, wherein said control information is located on said recording medium such that said control information is reproduced prior to said first audio data.

22. The reproducing method according to claim 19, wherein second audio data to be reproduced along with said video data is recorded in addition to said first audio data, and said control information includes a first field holding a command for controlling presentation of said first sub-picture data only while said first audio data is being reproduced, a second field provided for designating which on of a start and a termination of said presentation should be controlled by said command, and a third field provided for designating a timing of executing said command.

23. The reproducing method according to claim 19, wherein second sub-picture data which can be presented along with said first audio data and can be selectively set in one of a presentation mode and in a non-presentation mode in association with said first audio data is recorded in addition to said first sub-picture data, and said control step is capable of selecting one of said first and second sub-picture data.

* * * * *

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(51) Int. Cl.[6]		(11) 공개번호	특1996-0038743
G11B 5/02		(43) 공개일자	1996년11월21일
(21) 출원번호	특1996-0028373(분할)		
(22) 출원일자	1996년07월13일		
(62) 원출원	특허 특1996-0011189 원출원일자: 1996년04월13일		
(30) 우선권주장	95-114017 1995년04월14일 일본(JP)		
---	---
(71) 출원인	가부시기가이샤 도시바, 사또오 후미오
	JP
	일본 가나가와켄 가와사키시 사이와이쿠 호리가와 쵸오 72
(72) 발명자	다이라 가즈히코
	JP
	일본 도쿄도 미나토쿠 신바시 3-3-9 도시바 에이.브이.이. 가부시기가이샤나이
	기쿠치 신이치
	JP
	일본 도쿄도 미나토쿠 신바시 3-3-9 도시바 에이.브이.이. 가부시기가이샤나이
	구라노 도모아키
	JP
	일본 가나가와켄 가와사키시 사이와이쿠 야나기쵸 70 가부시기가이샤 도시바 야나기쵸 공장내
	미우라 히데키
	JP
	일본 가나가와켄 가와사키시 사이와이쿠 야나기쵸 70 가부시기가이샤 도시바 야나기쵸 공장내
	하기오 다케시
	JP
	일본 도쿄도 미나토쿠 시바우라 1-1-1 가부시기가이샤 도시바 본사내
(74) 대리인	이상섭
	나영환
(77) 심사청구	있음

(54) 출원명 **데이타 배열에 대한 관리 정보와 함께 재생 데이타를 기록하는 기록 방법**

요약

광디스크에는 재생 대상으로써의 비디오 오브젝트 세트(VTST_VOBS)(295) 및 관리정보로써의 비디오 타이틀 세트(VTST_VOBS)(295) 내에는 비디오, 오디오 및 부영상 데이타가 저장되어 있는 다수의 데이타셀이 배열되어 있다. 비디오 타이틀 세트 정보(VTSI)에는 셀이 집합으로 차례로 재생되는 프로그램을 조합한 프로그램 체인(PGC)에 관한 관리정보가 비디오 타이틀 세느 PGC테이블(VTS_PGCIT)에 기술되어 있다. 사용자로 부터의 입력에 따라서 상기 PGC 테이블(VTS_PGCIT)을 참조하여 PGC의 재생순서를 변경가능하고, 다양한 형태로 PGC를 차례로 재생할 수 있다.

대표도

도1

명세서

[발명의 명칭]

데이타 배열에 대한 관리 정보와 함께 재생 데이타를 기록하는 기록 방법

[도면의 간단한 설명]

제1도는 본 발명의 일실시예에 관한 광디스크 장치를 개략적으로 도시하는 블록도.

본 내용은 요부공개 건이므로 전문내용을 수록하지 않았음

(57) 청구의 범위

청구항 1.

영상 데이타가 각각 저장되어 있는 복수개의 영상 데이타 셀이 집합되어 있는 제1데이타배열을 생성하는 공정과, 상기 제1데이타 배열내의 영상 데이타 셀의 재생 순서를 규정하는 제1셀 재생정보 및 상기 제1데이타 배열의 데이타 내용에 관한 제1내용 정보를 포함하는 제1데이타

배열을 관리하는 제1관리 정보를 생성하는 공정과, 기록 매체의 데이타 영역의 제1세그먼트 영역에 제1관리 정보를 기록하는 공정과, 기록 매체의 데이타 영역의 제1세그먼트 영역과는 다른 제2세그먼트 영역에 제1데이타 배열을 기록하는 공정을 포함하는 것을 특징으로 하는 기록 방법.

청구항 2.
제1항에 있어서, 영상 데이타가 각각 저장되어 있는 복수개의 셀이 집합되어 있는 제2데이타 배열을 생성하는 공정과, 상기 제2데이타 배열내의 영상셀의 재생 순서를 규정하는 셀 재생 정보 및 상기 제2데이타 배열의 데이타 내용에 관한 제2내용 정보를 포함하는 제2데이타 배열을 관리하는 제2관리 정보를 생성하는 공정을 추가로 포함하고, 상기 기록 공정은 기록 매체의 데이타 영역의 제1세그먼트 영역에 제1관리 정보와 함께 제2관리 정보를 기록하고, 기록 매체의 데이타 영역의 제1세그먼트 영역과는 다른 제2세그먼트 영역에 제1데이타 배열과 함께 제2데이타 배열을 기록하는 것을 특징으로 하는 기록 방법.

청구항 3.
제2항에 있어서, 상기 제1 및 제2내용 정보에는 각각 제1 및 제2데이타 배열이 접속되는 데이타 배열의 유무 및 접속지의 데이타 배열의 번호가 기술되는 것을 특징으로 하는 기록 방법.

청구항 4.
제2항에 있어서, 영상 데이타가 각각 저장되어 있는 복수개의 셀이 집합되어 있는 제3데이타배열을 생성하는 공정과, 상기 제3데이타 배열내의 영상셀의 재생 순서를 규정하는 셀 재생 정보 및 상기 제3데이타 배열의 데이타 내용에 관한 제3내용 정보를 포함하는 제3데이타 배열을 관리하는 제2관리 정보를 생성하는 공정을 추가로 포함하고, 상기 기록공정은 기록매체의 데이타 영역의 제1세그먼트 영역에 제1 및 제2관리 정보와 함께 제3관리정보를 기록하고, 기록 매체의 데이타 영역의 제1세그먼트 영역과는 다른 제2세그먼트 영역에 제1 및 제2데이타 배열과 함께 제3데이타 배열을 기록하는 것을 특징으로 하는 기록 방법.

청구항 5.
제4항에 있어서, 상기 제1, 제2 및 제3내용 정보에는 각각 제1, 제2 및 제3데이타 배열이 접속되는 데이타 배열의 유무 및 접속지의 데이타 배열의 번호가 기술되는 것을 특징으로 하는 기록 방법.

청구항 6.
제1항에 있어서, 상기 제1내용 정보에는 제1데이타 배열이 최초에 재생되는 지의 여부의 엔트리 정보가 기술되는 것을 특징으로 하는 기록 방법.

청구항 7.
제1항에 있어서, 상기 제1내용 정보에는 제1데이타 배열중의 셀 데이타의 수가 기술되는 것을 특징으로 하는 기록 방법.

청구항 8.
제1항에 있어서, 상기 영상 데이타 셀은 영상을 재현하기 위한 비디오 데이타 팩, 오디오를 재현하기 위한 오디오 데이타 팩 및 부영상을 재현하기 위한 부영상 데이타 팩을 포함하고, 오디오 데이타 팩은 오디오 스트림 번호로 특정되는 선택적으로 재현가능한 1이상의 오디오 스트림을 포함하고, 부영상 팩은 부영상 스트림 번호로 특정되는 선택적으로 재현가능한 부영상 스트림을 포함하는 것을 특징으로 하는 기록 방법.

청구항 9.
제1항에 있어서, 상기 제1내용 정보에는 선택가능한 오디오 스트림의 번호가 기술되고, 선택가능한 부영상 스트림의 번호가 기술되는 것을 특징으로 하는 기록 방법.

청구항 10.
제1항에 있어서, 상기 제1내용 정보에는 대응하는 제1데이타 배열의 반복 재생의 유무 및 반복 재생되는 횟수가 기술되는 것을 특징으로 하는 기록 방법.

청구항 11.
제1항에 있어서, 상기 제1내용 정보에는 대응하는 제1데이타 배열의 재생후에 재생 상태가 정지되는지의 여부 및 재생 상태가 정지되는 경우에는 그 시간에 관한 정보가 기록되는 것을 특징으로 하는 기록 방법.

청구항 12.
제1항에 있어서, 상기 제1관리 정보는 대응하는 제1데이타 배열의 재생전에 그 재생에 관련한 처리를 기술한 프리 명령 정보를 포함하는 것을 특징으로 하는 기록 방법.

청구항 13.
제1항에 있어서, 상기 제1관리 정보는 대응하는 제1데이타 배열의 재생후에 그 재생에 관련한 처리를 기술한 포스트 명령 정보를 포함하는 것을 특징으로 하는 기록 방법.

청구항 14.
제1항에 있어서, 상기 포스트 명령 정보는 대응하는 제1데이타 배열의 재생 과정에 외부로 부터의 입력에 따라서 처리를 변경하는 명령을 포함하는 것을 특징으로 하는 기록 방법.

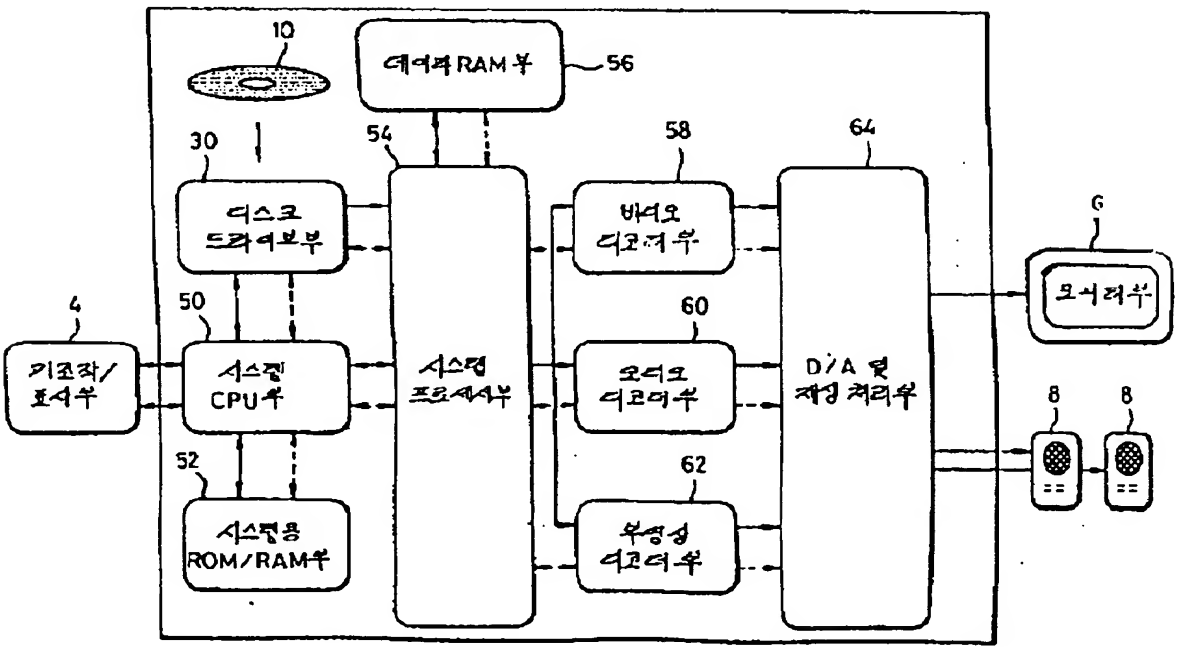
청구항 15.
제1항에 있어서, 상기 제1관리 정보는 대응하는 제1데이타 배열의 재생중에 그 재생에 관련한 명령 처리를 기술한 인터셀 명령 정보를 포함하고, 제1셀 재생 정보는 특정의 데이타 셀의 재현 종료 후 인터셀 명령 정보로 기술되고, 실행될 명령 처리를 특정하는 정보를 포함하는 것을 특징으로 하는 기록 방법.

청구항 16.
제1항에 있어서, 상기 영상 데이타 셀은 영상을 재현하기 위한 비디오 데이타 팩, 오디오를 재현하기 위한 오디오 데이타 팩 및 부영상을 재현하기 위한 부영상 데이타 팩을 포함하고, 사용자가 선택가능한 항목이 부영상 데이타 팩에 의해서 재현되는 것을 특징으로 하는 기록 방법.

청구항 17.
제1항에 있어서, 상기 제1셀 재생 정보는 상기 데이타 영역중의 상기 제1데이타 배열의 선두 데이타 셀의 개시 어드레스를 포함하는 것을 특징으로 하는 기록 방법.

청구항 18.
제1항에 있어서, 상기 제1셀 재생 정보는 상기 데이타 영역중의 상기 제1데이타 배열의 최종 데이타 셀의 개시 어드레스를 포함하는 것을 특징으로 하는 기록 방법.

청구항 19.
제1항에 있어서, 상기 데이타 영역에는 상기 제1관리 정보를 검색하기 위한 검색 정보가 추가로 기록되어 있는 것을 특징으로 하는 기록방법.
※ 참고사항 : 최초출원 내용에 의하여 공개되는 것임.

도면

도면 1